METAL FINISHING

PREPARATION, ELECTROPLATING, COATING

PUBLISHED FOR THIRTY-SEVEN YEARS AS METAL INDUSTRY

CLEPO 166

A Steel Electrocleaner that can be used with either Cathodic (Direct) or Anodic (Reverse) current in every Cleaning Cycle prior to Bright Nickel or other plating operations.

Founded as *METAL INDUSTRY*, *January*, 1903 *by*
PALMER H. LANGDON
1868-1935

METAL FINISHING

VOLUME 44 JANUARY, 1946 NUMBER 1

Publication Office
11 West 42nd St.
New York 18, N. Y.

PUBLISHED MONTHLY—Copyright 1946 by The Metal Industry Publishing Company, Incorporated, 11 West 42nd St., New York 18, N. Y. Entered February 25, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1879. Re-entered as second class matter June 13, 1940, at the post office at New York, N. Y., under the Act of March 3, 1879.

SUBSCRIPTION PRICES: United States, $2.00 per year; Canada, $2.50 per year (includes 50c exchange and tax). Foreign $5.00. Single copies 25c. Please remit by check or money order; cash should be registered.

ADVERTISING RATES on application. Forms close the 25th of preceding month. Adertising copy should be mailed in time to reach us on or before the 20th of the preceding month.

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VOL. 44, NO. 1

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JANUARY, 1946

What Isn't Started Cannot Be Finished

For the first time in five years we have celebrated a Christmas unshadowed by war clouds. For the first time in five years we can look forward to the assurance of a full year of production for human betterment instead of destruction. A wonderful feeling, isn't it?

Our reconversion plans, however, have proceeded at a slower pace than was expected. Labor shortages, union difficulties, scarcity of materials, high corporation taxes and price ceilings which do not reflect greatly increased manufacturing costs, all of these have been links in the chain hobbling industry. Recognition of their mutual responsibilities by labor, management and government is the force required to break this chain and we look forward to an early resumption of the cooperation which made our industrial machine such a marvel of productivity during the war years.

The pent-up demand for the products contributing to the maintenance of our high standard of living, a demand which has not been satisfied, even in small part, for four years, indicates busy times ahead. The temptation to skimp on quality because of the starved condition of the market is a hard one to resist and the example set by the automobile industry is, therefore, more notable. Heavier deposits and better overall quality should be the goal of all manufacturers who electroplate or otherwise coat their products. If management is unaware of the value of better and heavier coatings, it is up to the metal finisher to sell the idea.

Our industry is ready to go ahead. Most finishing materials are on hand, equipment is ready and, except for a temporary shortage of polishers, we are in an excellent position to go into full production. Unfortunately, we cannot proceed ahead of the field. We cannot start until all industry starts. Our contribution to the finished product is one of the last steps in production. We must therefore wait for all industry to settle its differences before any progress can be made in the finishing department.

Technical Developments of 1945

By NATHANIEL HALL and G. B. HOGABOOM, JR.

Associate Editors—Metal Finishing

THE theoretical aspects of electrodeposition and surface treatment seem to have been completely neglected during the war years, except for those studies which were in progress at the war's onset and which were completed shortly after. We do not speak, of course, of the projects whose connection with national security during this period was such as to necessitate holding up publication of the results. Because of the preoccupation with production problems, the last few years have seen a gradual decline in the number of theoretical papers published so that last year we were able to report only two and this year none at all.

Anodizing

Because of the recent shortage of chromic acid, certain government agencies, during the last days of the war, recommended that chromic acid anodizing solutions be maintained by additions of sulfuric acid. Of interest in this connection were the findings of Jackson[1] that *addition of sulfate* to the bath affects the opacity of the film but not the corrosion resistance. High sulfate contents were found to shorten the life of the bath because of rapid reduction of hexavalent chromium but employment of very small cathode areas tended to prevent this action.

The *structure of anodized coatings* on aluminum and their effect on serviceability, as determined by production procedure, were studied by Keller and Edwards,[2] while the latter, together with Taylor and Tucker[3] conducted a series of experiments which indicated that *high anodizing voltage favors the formation of gamma alumina*, according to the X-ray patterns which were obtained.

A patent history and digest of the more important patents on this subject was offered by Hogaboom[4] while an interesting patent on a method of *anodizing aluminum articles in bulk* was disclosed by Herrick,[5] who claimed the *use of a cylindrical container of metal* to be rotated with sufficient speed so that centrifugal force would serve to hold the articles in contact with the conducting walls of the container.

Corrosion Prevention

Minimizing of corrosion by chemical treatment was not only the subject of numerous patents but was treated in the technical literature to a greater extent than during the previous year. New developments were forthcoming in the field of *phosphate coatings*, especially for iron and steel, for which Silman[6] claimed the treatment most suitable after a *comparison of caustic black, phosphate and black nickel* as protective coatings. Tanner was granted patents[7, 8] on the *exertion of pressure on sheets* by means of rolls, while being treated with the phosphating solution, in order to produce an improved coating. Clifford and Adams[9] received a patent on the *addition of a nitro compound* as an accelerator, Richards[10] also claimed an improvement similar to that of Tanner, above, in the *use of rolls*, and Bayley[11] covered *a pretreatment as both cathode and anode in a fused sodium hydroxide bath*.

Magnesium was the subject of three articles of interest and three patents. Hogaboom[12] published *a patent history of the electrolytic processes* for protecting this metal from corrosion and a *review* of virtually all the treatments developed to date was presented by Bleiweiss and Fusco[13] in their survey. Howden-Simpson studied the *effect of time of immersion and pH* on the films produced in the dichromate-ammonium sulfate bath,[14] the results indicating that a treatment time of 10 minutes at pH 6.0 produced the best films. Of the patents, Bushrod[15] received one on a solution of *not less than 10% dichromate plus from 6 to 10% nitric acid*, Allen and Morgan[16] claimed

(Courtesy Westinghouse Electric Corp.)

a process in which the metal is subjected to an *atmosphere containing at least 15% by volume of steam and at least 10% of uncombined oxygen* at elevated temperatures to produce a corrosion resistant coating, and Elssner and Schroder[17] patented a *pretreatment in a 200 g./l. solution of ammonium chloride* prior to anodic treatment.

Two papers were offered on the subject of chromate films on zinc. Maxon[18] described the *Cronak process* and discussed the *operation of the solution* and the causes for poor results, while Clarke and Andrew[19] presented the results of a very complete study, which included the *effect of variables*, characteristics of the films, both fresh and aged, and preferred conditions for operation of chromate baths.

Miscellaneous papers and patents included a description by Grupp[20] of the *process used by the Navy* to prevent corrosion of metal articles in the Pacific area, a patent granted to Jernstedt[21] on a *tarnish resistant coating* produced by treatment as cathode in a solution of beryllium sulfate and boric acid at pH 5.5 to 5.9 followed by a bake at 250-400° C. and the *passivation of stainless steel* by immersion in a hydrochloric acid solution containing less than 1% quinoline ethiodide, patented by Uhlig.[22]

Oils containing various organic materials as *corrosion inhibitors* were claimed in a number of patents. White,[55] Barnum,[23] Barnum and Zublin,[24] Zublin, Barnum and White,[25] Cohen,[26] Roden,[27] and Gaynor White and Watson[28] were all granted patents on such materials.

Polishing

Albin[29] described the *advantages of abrasive belts* over wheel polishing, the *chemistry of polishing and buffing abrasives* was discussed, in not too great detail, by Power, and the proper handling of *animal glue abrasives and wheels* for maximum efficiency was outlined by Sweatt.[31] Production of highly finished surfaces on bulk work by *barrel polishing* was the subject of a series of articles by MacNair,[32] while a *tumbling barrel* of novel design was patented by Hoffman[33] and a *wooden barrel liner* was the subject of a patent granted to Huenerfauth and Green.[34]

Buffing and polishing wheels, discs, pads and rolls were patented by Case,[35] Fuller,[36] Hall and Rock,[37] Rice,[38] Schlegel[39] and Losey,[40] *an automatic buffing machine* was claimed by Belcourt[41] and a new type of *grinding and polishing booth* was patented by Fisher.[42]

Only one paper worthy of note was presented on electrolytic polishing. This was a complete survey of the literature on *electropolishing of stainless steel and other metals* which was separated into low and high voltage processes by Zmeskal, the author,[43] and included a list of formulas and 114 references. Among the patents, Faust led the field with new developments. The patent granted to him included a solution of *phosphoric acid, chromic acid and water for zinc*,[44] for *stainless steel*[45] and for *nickel*,[5] and a solution of *phosphoric acid, trivalent aluminum and water* for *copper*.[47] Tosterud[48] claimed a solution of *hydrofluoric acid, glycerine and water* for *aluminum-silicon alloys*, Weisberg and Levin[49] were granted a patent on a bath comprising *sulfuric acid, lactic acid, phosphoric acid and water* in stated proportions, Clingan received one on a 60-90% solution of *sulfuric acid* in water for *stainless steel*[50] and Horwedel and Reese claimed, for the same group of metals, an electrolyte of *chromic acid, water and either acetic or formic acid*.[51]

Other patents included one to Edmonson[52] for a *rejuvenation* process for a hydrochloric acid-glycerine electrolyte, which involved addition of acetone to precipitate the metal

salts, another to Tour and Howe[53] on a barrel for *pickling and electrolytic polishing articles in bulk* in the sulfuric-hydrofluoric acid bath, and a third to Pullen on the production of *highly reflective surfaces* of the Alzak type on aluminum, including anodic treatment in a hot alkaline electrolyte for brightening, followed by further anodic treatment in an acid electrolyte to produce an oxide film on the brightened surface, after which the article is rinsed in hot water and immersed in an acid solution containing an aluminum salt and a fluoride to selectively remove the oxide film produced in the brightening treatment.[54]

Cleaning—Degreasing

Only rarely is a metal truly clean when it enters a plating gath, according to Lyons.[56] Describing the *different types of films*, he considers, in general, that a clean surface is one on which objectionable surface films have been replaced by films more suitable for electroplating. Sanders[57] discussed the basic factors involved in *detergency*, namely, wetting, buffer action, emulsification, saponification, colloidal activity, solvent power and pH. *Cleaning methods* and their application were described by Hirdler[58] and Townsend[59] while Gauthier covered the *cleaning of various non-ferrous metals* prior to finishing[60] and Black discussed the subject of *cleaning prior to packaging* to prevent corrosion in storage.[61] Following up the annotated bibliography on aluminum cleaning, which he prepared the previous year with Mears, Harris[62] listed a series of suggested and currently used *evaluation tests* for metal cleaners which should serve as a very valuable source of information on this subject.

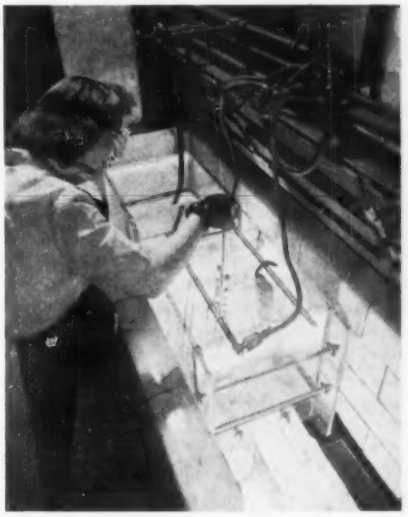
New cleaning compositions were the subject of patents, one of the most interesting being a *cleaner for tin*, composed of alkali metal metasilicate, alkali metal perborate, a zinc salt and an inhibitor consisting of a magnesium salt and an alkali metal silicate having a ratio of not over 1:2, granted to Schwartz.[63] A *cleaner for aluminum and magnesium* made up of sodium salts of orthophosphoric acid and silicic acid was patented by Hart,[64] a *solvent emulsion* cleaner consisting of completely saponified talloel, excess potash, triethanolamine, pine oil and ethylene glycol mono butyl ether, was claimed by Lowe,[65] and *detergent compositions which could be briquetted* were patented by McMahon.[66] *Cleaning machines* of various types appeared among the new inventions, developments being introduced by Nachtman,[67] Zinty,[68] Stine,[69] Ransohoff,[70] Reed,[71] McGuinness,[72] Miller[73] and Thompson.[74]

Degreasing came in for a great deal more attention than during the previous year. Among the articles of interest were a series by Payne[75, 76] on the basic principles of *vapor phase degreasing*, including suggestions with the view of securing optimum solvent economy and elimination of health hazards, and one by Joyce[77] on the proper *installation and operation* of both trichlorethylene and perchlorethylene degreasers.

Petering and Aitchison[78] received patents on organic materials to be added to chlorinated solvents to *prevent decomposition* in the presence of aluminum, and new ideas in *degreasing machines* were claimed in patents issued to Woppman, Hummel and Newman,[79] Helfenstein,[80] Hunter and Stine[81] and Kimmig and Peters.[82]

Abrasive Cleaning

One of those inventions so simple as to make the average metal finisher wonder why he hadn't thought of it before was brought to light during 1945. It was claimed by Eppler[83] and covered the *addition of a liquid* able to produce a rust resistant film to the sand blast nozzle so that the surface could be cleaned and rustproofed at the same time. Two other patents, to Swenarton[84] and to Oechsle and Childs[85] represented wet processes, namely the *addition of water to the blast* of abrasive and air. A *mild abrasive* for air blast cleaning, consisting of cooked and dried whole grain wheat was patented by Perry,[86] *sandblasting nozzles* were the subjects of patents granted to Heany,[87] Sorrentino[88] and Keefer;[89] and a *mixer valve* was claimed by Eppler.[90] Improvements in *sand blasting machines* were patented by Mott,[91] Bick[92] and Franklin.[93]



(Courtesy Pittsburgh Plate Glass Co.)

Centrifugal blasting, the process of propelling abrasive without an air blast or nozzle, was the subject of four patents during the year, all on the rotors used on the apparatus. These were granted to Keefer,[94] Rosenberger,[95] Unger[96] and Potter.[97]

Pickling

The most interesting development of the year in the field of scale removal was the patent granted to Gilbert[98] on the use of a *molten caustic soda bath containing sodium hydride*. The commercial bath, according to Dr. Gilbert[99] contains 1.5-2% sodium hydride dissolved in fused caustic soda at 700° F., in which the oxide is reduced to metal and the hydride is converted to caustic soda, balancing the drag-out loss. The film of reduced metal is blasted off by the steam developed in the subsequent water quench and any remaining smut is removed in an acid dip. The process was also described by Albin[100] and by Townsend.[101]

An ingenious method of setting tanks 5' x 6' x 7' into floor pits highlighted an article on the *installation of a pickling department* by Smith and Carno.[102] The pits were filled with water, the tanks were launched and finally scuttled in place by opening the sea cocks (drain plugs). *Agitation of pickling baths* by introducing a mixture of steam and a non-condensable gas was patented by Dailey[103] and a machine for *continuous strip pickling* was claimed by Dishauzi.[104]

A patent covering a method of *producing an excellent bond* between a non-ferrous metal and an iron base was issued to Pike.[105] In this process the iron base is anodized in a hot alkaline bath at about 4 amp./sq. ft. for 5-10 minutes until a loosely adherent film of iron oxide is produced, the film is brushed off, the surface is treated as anode in an acid solution and is then plated. Other alkaline pickling baths patented included a *fused bath of caustic soda and sodium cyanide* at a temperature below 600° C., claimed by Young[106] and the use of the *fusion kettle as the anode* in a bath of molten sodium compound containing a compound of nitrogen and oxygen, claimed by Forsberg.[107] *Gas pickling*, a process which is showing promise, was the subject of only one patent, to Renkin[108] on an improvement in the treatment of continuous metal strip.

In a study of *pickle liquor treatment*,[109] Hoak, Lewis and Hodge found that substantial economy can be realized by using pulverized high calcium limestone to neutralize the free acid and precipitate part of the iron, and lime to complete the treatment. Methods of *acid and iron recovery* from the pickle, which lend themselves to large scale operation, were the subjects of three patents. Urban received two on the provision of a *mercury cathode and insoluble anode* in the solution consisting of sulfuric acid and ammonium sulfate and electrolyzing in the presence of the article being pickled so that the iron is plated out as fast as it dissolves, thus maintaining the acid and iron contents constant.[110] Schumacher and Heise[111] electrolyze with a *mercury cathode and a porous carbon anode*, some of the iron being oxidized to the ferric form and withdrawn through the porous anode and the iron-mercury amalgam formed at the cathode being electrolyzed in a dilute sulfuric acid bath to remove the iron.

A number of *acid pickling inhibitors* were developed. Clark[112] patented an *aminated chlorinated aliphatic hydrocarbon*. McCulloch[113] received a patent on hydrochloric acid contacted with crude phenols of petroleum origin. Ruys and Wachter[114] received one on sulfuric acid previously used as an alkylation catalyst. Pinkney and Stevenson[115] claimed thiazolinyl sulfide and Johnson[116] inhibited hydrochloric acid with spent lactic acid and oxalic acid.

Acid bright dips were reviewed by Soderburg[117] who proposed a *theory of bright dipping* which paralleled that for anodic brightening. Glycolic acid baths for *brightening high copper alloys* were patented by Dittmar[118] and a *bright dip for cadmium and zinc* was patented by McCarroll, McCloud and Hanson,[119] comprising about 120 g. chromic acid, 0.25-0.50 g. sulfuric acid and 0.8-1.2 g. nitric acid per liter, the ratio of chromic acid to the combined sulfuric and nitric acids being about 100:1.

Coatings

GENERAL

The *influence of anodes* in plating processes was described by Goodwin and Bechtold,[120] among the anodes reviewed being a novel modification of the old disc or quoit anode, consisting of gear-shaped segments. In discussing anode hooks, the authors however, seemed to be unaware of the use of square rods bent so that the contact with the anode rod is on the edge, the most common hook in use today. Binai[121] presented a paper on the use of *insoluble anodes* in conjunction with a *solution regenerating process* for silver and copper, including the chemical reactions.

Defects in the metal and in the drawing operations which result in poor deposits, usually blamed on the plater, was the subject of an article by Jevons[122] and *adhesion* was covered in articles by Lewis[123] who discussed the factors affecting adhesion of deposits on ferrous and non-ferrous metals, and by Ferguson and Stephan[124] who reviewed the *literature,* as part of their work on the A.E.S. research project, including theoretical and experimental data and conclusions.

Narcus[125] surveyed the use of *fluoborate baths* for the deposition of most of the commonly employed metals, giving formulas and operating conditions. Now that concentrated metal fluoborate solutions are obtainable, this type of bath should be of interest for many applications where other types are unsuitable. Addition of *esterified aliphatic polyhydric alcohol sulfates and sulfonates* to nickel, cobalt, iron, zinc, cadmium, copper and antimony solutions was patented by Brown.[126] Copper, nickel and chromium *plating of zinc-base die castings* on a full automatic machine was detailed by Schoonover[127] in an article which is of timely interest since the parts plated consisted of automotive trim, which will be finished in enormous quantities from now on. Loose[128] received a patent on the *removal of iron, cobalt and nickel deposits from magnesium* with reverse current in a solution of hydrofluoric acid containing a small amount of a mineral acid and Russell patented a method for making a cup-shaped transmitter electrode by plating.[129]

On the subject of *alloy coatings,* the literature showed an article on *brass plating for rubber adhesion* by Hayford and Rogers,[130] who confirmed previous findings that the deposit must be in the range of 65-80% copper and explained the mechanism of the bonding effect. Schoonmaker and Stockton[131] received a patent on the *deposition of nickel followed by tin,* the composite coating being heated to diffuse the tin into the outer portion of the nickel and Ruben[132] claimed the use of *separate anodes* of each of the alloying elements, half wave rectifiers being connected to each anode so that a pulsating direct current enters the solution.

A roller assembly for *plating fine wire* was described by Kronsbein and Smart,[133] the wire being wound on a vertical helix, similar to the system developed in this country before the war for plating slide fasteners. The authors claimed that a tank 20″ wide x 34″ long x 21″ deep will accommodate 150 ft. of wire while with the conventional design it would be necessary to use tanks 150′ long, ignoring the fact that the conventional long tanks will accommodate up to 60 strands so that the output per foot of length is comparable. Drawing the wire through *electrically connected drawing dies* while applying the deposit was claimed in a patent granted to Lang.[134] Other equipment developments included patents issued to Martin,[135] to Wood[136] and to Drummond and Bench[137] on *plating machines,* a patent to Egli and Bokenkamp[138] on a *cylinder plating apparatus* for printing rolls in which a roll burnishes the deposit as it forms, and patents to Ward[139] and to Hall[140] on units for *continuous treating sheet stock.*

Three patents were granted on *metal spray guns* to Shepard and Ingham[141, 142] and some applications of *metal spraying as a production process* were discussed by Kunkler.[143]

CHROMIUM

The most important development reported in this field during 1945 was the use of *oxalic acid as an etch* before hard chromium plating, described by Makepeace[144] as much more economical than chromic acid etching from the standpoints of current consumption, solution cost and speed. A 10% solution of oxalic acid containing a very small amount of wetting agent is employed for 30 to 60 seconds at room temperature, using 6 volts and 0.5-1.0 amp./sq. in.

Another development of interest was the production of *machinable chromium deposits* below 400 Vickers in hardness by Gardam[145] by increasing the temperature of the standard sulfate bath to 85° C. and heating the deposits at 150-250° C. Plating *hard chromium directly on carbon and graphite* was described by Herwig,[146] using a high current density strike until complete coverage was obtained after which the current density was dropped to a low figure to minimize strains in the deposit. Production of non-reflecting *gray chromium finishes* on telescoping antennas was the subject of an article by Hirsch.[147] This process takes advantage of the milky range of the chromium bath but the author employed two plating solutions with an intermediate rinse, whereas for at least two years prior to the end of the war other platers had been obtaining the same effect on these antennas with only one solution, by breaking the contact of the rack with the work rod momentarily when the tubes were partly plated.

A new chromium bath consisting of *chromium salt and an alkyl hydrocarbon polyamine,* patented by Harford[148] was the only new development in chromium plating solutions and a review of *current German practice* in hard chromium plating by Sawin[149] indicated that it does not differ from ours. The fundamentals of *hard chromium plating* were discussed by Dale,[150] who described the *construction of anodes* for throwing the deposit into recesses, and other examples of *unique racks and plating fixtures* were presented with excellent sketches by Vaughan and Usher.[151] *Chromium plating of piston rings* was the subject of a patent granted to Van der Horst.[152] It was found by Sussman, Nachod and Wood[153] that *recovery of chromic acid from wastes* by means of anion exchange is entirely feasible.

(*Courtesy Westinghouse Electric Corp.*)

COPPER—NICKEL—CADMIUM

All the developments in copper plating during the year were in connection with acid solutions, copper cyanide being mentioned only once, as *an addition agent* to a copper sulfate-sulfuric acid bath, claimed in a patent received by Hull.[154] Stareck and Passal[155] were granted a patent on a *bath comprising copper, formate radicals and ammonium radicals* and having a pH value between 2 and 4 electrometric. *Thiourea*

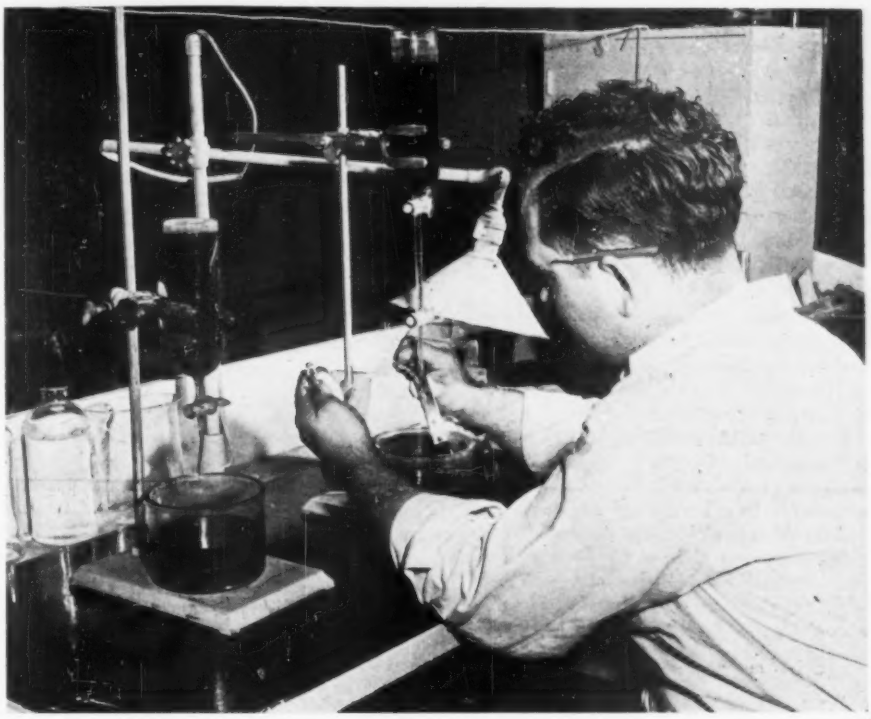
appears still to be the subject of research as a brightener for acid copper solutions. Brenner and Young[156] studied the effect of this agent, their work paralleling that of Philipps and Clifton, reported in 1942. Unfortunately, errors in a number of the figures reported detract from the paper's authoritativeness. The authors found 0.01-0.03 g./l. of thiourea to be the best concentration without production of excessive brittleness. A patent was granted to Beaver[157] on *a brightener* consisting of aryl and alkyl substitution products of thiourea and acetyl hydrochloride, nitrate and metal salt derivatives of thiourea, a wetting agent and a material such as dextrose, sugar or sulfonated creosote.

Only two papers on nickel plating were worthy of note. One was by Waite[158] on the *composition and operation of bright nickel solutions* and the other an excellent study of the *addition of nickel sulfate to Wesley's chloride bath* by Pinner and Kinnaman.[159] As a result of the sulfate addition, the advantages of the chloride bath are retained and the rapid change in pH is eliminated. Ductile deposits were obtained at 100-300 amp./sq. ft. and, although the deposits were only semi-bright, they could be brightened still further by the use of organic brighteners. A patent on the use of *electrolytic nickel anodes* in a sulfate-chloride bath was granted to Amundsen.[184]

Cadmium was covered by one article by Strid,[160] who claimed that the *cadmium plate* which has been generally specified for stainless steel exposed to salt water atmospheres could be safely omitted, as a result of exposure tests, a patent on the addition of an *foamketaldoresin and a sulfonated vegetable oil* to the cyanide bath as a brightener, received by Hull[161] and a patent granted to Harford on an *alkyl hydrocarbon amine bath*[162] with a pH between 9 and 10.3 approximately and containing no cyanide.

TIN—ZINC

The protective value of *electrotin as an undercoat for zinc, cadmium and nickel* was studied by Wernick.[163] He found that a tin undercoat results in more uniform distribution of the subsequent deposit, greatly increased corrosion resistance in the case of zinc and cadmium, and to some extent in the case of nickel. A complete investigation of the *deposition of tin from the potassium stannate bath* was presented by Sternfels and Lowenheim.[164] This bath may be operated at much higher speeds than the sodium bath and has much less decomposition, a comparison of the results indicates. Electrolytic tin baths were claimed in two patents. One granted to Dowling and Taylor[165] was on *a solution of stannous oxalate, ammonium oxalate, oxalic acid and gelatine,* with a pH of 2 to 4, used for coating the copper oxide layer of rectifier elements, and the other to Nachtman was on a solution containing *stannous ions, sulfuric and hydrofluoric acid, a sulfonated organic substance from the group consisting of o-phenyl phenol, and alpha-naphthol, together with nicotine.*[166] An *immersion tin bath for aluminum,* consisting of sodium acetate and an alkali metal stannate, was patented by Blackman and Mikula,[167] and another *immersion bath for copper and its alloys,* consisting of tin chloride, sulfuric acid and thiourea was claimed by Sullivan and Pavlish.[168]



(*Courtesy Westinghouse Electric Corp.*)

Detinning by heating tinplate to the softening point of the tin and rubbing with silica gel and sawdust, the latter to protect the tin and steel from the atmosphere, was patented by McCoy[169] and three patents were granted on the *brightening of tin* after electrodeposition, one to Vore on an *induction-heating apparatus,*[170] one to Nachtman[171] on *heating the deposit with vapor of a petroleum hydrocarbon* having a boiling point above the melting point of tin, in order to flow it, and one to Glock[172] on *cold rolling* under great pressure to impart a lustrous surface on electroplated strip.

In the course of production of zinc coated sheets of very uniform deposit thickness, the effects of variables on the *cathode efficiency and throwing power of cyanide zinc baths* were investigated quite thoroughly by Safranek,[173] the results being presented in a valuable article. A very complete *survey* of the electrodeposition of this metal was also presented by Gray in a series of articles[174] which covered the deposit, the solutions and their control.

Carlson and Krane[175] described the *fluoborate zinc solution* and its operation, the advantages including high speed of deposition, and a zinc bath containing an *alkyl hydrocarbon diamine* and having a pH of 8 to 12 was patented by Harford.[176]

OTHER METALS

A new *antimony bath* comprising antimony trifluoride and an ammonium fluoride at pH below 6 was claimed by Bloom[177] to produce ductile, fine-grained, non-porous and adherent deposits.

Greater stability was produced in the *indium cyanide bath* by increasing the pH. The *high pH solution* was found by Mohler[178] to show almost complete absence of precipitate during operation and to have high efficiency. Details on *lead and indium plating of bearings* were presented by Wright,[179] information which heretofore had been taboo as a subject in the technical literature of this country. The paper indicated the absence of high speed plating of bearings in England, contrary to practice in this country.

Results of *wear tests on gold deposits* indicate, according to Hogaboom,[180] that a good lacquer over a thin gold deposit will give superior wear resistance to a heavy gold deposit.

Direct deposition of *silver on steel* has not been satisfactory for adhesion after heating at 400° C. for at least 1 hour but anodic etching in sulfuric acid followed by nickel and copper plating before silver gave the most satisfactory results, according to Sprague.[181] Where thick deposits are produced and laminated structure due to current interruptions must be avoided, batteries may be used for *stand-by power.* The mechanical and electrical features of such a hook-up were described by Patrick.[182] One patent was granted on silver plating, the production of thick, non-porous deposits at high current density with the use of a *rotating cathode and solution circulation* being claimed by Schaefer.[183]

HOT DIPPED COATINGS

Imhoff contributed a few more of his informative articles on *hot galvanizing,* showing in one article that the major source of *galvanizing dross* is due to corrosion of the steel after pickling, the iron oxide and salts being reduced by the zinc to furnish the metallic iron for the iron-zinc alloy.[185] In another[186] he described the *liquid flux technique* using zinc ammonium chloride as compared to the old muriatic acid dip flux, showing how the formation of dross and oxide skimmings, due to iron salts entering the bath, are practically eliminated. In a third[187] he showed how the use of a *zinc ammonium chloride flux* having

a specific gravity of 1.3-1.6, at 180-200° F. fluxes the surface and prevents rusting during the interval before hot galvanizing, eliminating the old steel hot plate dryer. The *coating of steel ammunition cases* by hot galvanizing was discussed by Baldwin,[188] who covered the processing procedures. The *application of a copper coating to steel stock* prior to hot galvanizing was claimed to minimize diffusion between the zinc and the ferrous stock, according to a patent issued to Avallone.[189]

Pretreatment of iron, copper and nickel basis metals with *a reducing gas at an elevated temperature and with a halogen acid gas* just prior to hot dipping was claimed to import a wetting characteristic to the surface of the base so that it will take a continuous and adherent coating, according to a patent granted to Fink.[190] A *hot tinning machine* for long lengths of strip was patented by Sherman[191] and a process for *hot tinning sheet* was claimed by Fairley, Lindquist, Michaels and Rodgers,[192] which included the elevation of some of the molten metal above the level of the oil cover and allowing it to drop through the oil layer, thus maintaining the oil at the desired temperature.

A machine for *hot dipping copper* on sheet iron was patented by Moise and Moise[193] while Young[194] received a patent on the *coating of a ferrous metal with copper* and then dipping in a molten lead bath in the presence of molten sodium cyanide. A patent was granted to Kalil on a process of *coating nickel and its alloys with lead*[195] *without cleaning*, by dipping in a molten flux of ferric chloride, ferric fluoride and zinc chloride prior to lead coating, and one on *terne coating* with the use of a flux comprising ammonium bromide and zinc chloride was issued to Finkbone and Marshall.[196] *Hot dipping machines* were the subjects of patents granted to Skipper,[197] Keller[198] and Sobell.[199]

Metallizing Non-Conductors

Production of *silver and copper conducting films* by chemical reduction were described in detail by Wein.[200] In other articles, the same author presented data on gold, lead, nickel and antimony films, cathode sputtering, metal spraying[201] and also on *metallic paints* for firing on glass and ceramics, including the plating procedures.[202] Procedures for *plating on plastics* were discussed also by Narcus,[203] who itemized the advantages of plated plastics over the unplated material.

Production of conducting coatings by imbedding the reductant substance in the nonconductor by impinging at high velocity an air suspension of the mixture, followed by immersion in a solution of a metal salt, was patented by Kathe.[204] A *reducing agent of the hydrazine type* plus a sulfate was claimed by Trevail and Gladney[205] for films to be produced by spraying a silver solution and the reducer. The process of *metallizing glass* by spraying a molten alloy of copper with small amounts of titanium and chromium was claimed in a patent issued to Haven.[206]

Evaporated coatings were covered by four patents, refinements in the process being claimed by Gold,[207] Guellich,[208] McManus and Elder[209] and Colbert and Weinrich.[210]

Testing and Control

The amount of attention paid to the testing and control of solutions and deposits must be very gratifying to those who were in the industry during the days when metal finishing was an art and not a science. *Silver baths* were investigated by Gregory and Hughan,[211] who found that the *cyanide and metal content* could be determined *electrometrically* in one titration with standard silver nitrate. Copper and iron however, were found to interfere with the metal determination and, despite the experiences of the investigators, both are very often present in commercial solutions, the former due to chemical displacement when plating on copper alloys and the latter due to impurities in the cyanide salts. A new method of *controlling silver strike solutions* was developed by Schaefer and Mohler.[212] They found that cathode efficiency and deplating time were proportional to the silver cyanide concentration and designed a cell for rapid determination of approximate cathode efficiency in the absence of colloidal material. Dolance and Healy[213] proposed a spectrophotometric method for *determining nitrates* in the nitrate-cyanide bath. Cyanide, hydroxide and carbonate, which interfere, were precipitated with a mixture of barium perchlorate, silver perchlorate and perchloric acid.

Other solutions were studied from the analytical standpoint. Knanishu and Rice[214] determined iron and zinc simultaneously in *phosphate coatings* by means of a polarograph. Miceli and Mosher codeposited the copper and zinc in *brass plating solutions* with the addition of ammonium sulfate and ethanolamine as supporting electrolytes,[215] the weighed deposit then being dissolved in sulfuric-nitric acid and the copper deposited on a platinum electrode. The zinc was calculated by difference. McKee and Hamilton presented a rapid analytical procedure[216] for *hydrofluoric-nitric acid pickling baths for stainless steel*, including total acidity, iron, fluoride and nitrate. Coates[217] offered a novel procedure for sulfates in *dichromating solutions*, which involved precipitation of the sulfate by barium perchlorate in acid solution, filtration and precipitation of the excess barium as chromate upon making the solution neutral. The solution was then filtered and titration for chromate could then be converted to sulfate once the total dichromate in the bath had been determined. Foulke[218] described electrophotometric methods for small quantities of *nickel and chromium* and Brown patented a method of determining *hydrogen in steel* which may be adapted to the determination of hydrogen adsorption during electrolysis.[219].

Herwig and Leigh[220] described the measurement of *throwing power in anodizing baths* by the cavity method using a split block, dye absorption showing extent of penetration in the cavity. The authors also discussed the throwing power box and Pan's cavity method, crediting Blum and Hogaboom for the former, although Blum and Haring developed the method. Haas[221] presented a paper on the determination of *surface area* of parts to be plated, describing the various methods with a dessert spoon as an example. The difference between the highest and lowest figures obtained by all the methods was found to be only 3.2%.

Nomographs for quick determination of *current densities, thickness of deposits and time* for all metals used for electrodeposits were prepared by Covert[222] and by Hart.[223] In the field of *thickness testing*, the literature offered a *magnetic tester*, developed by Spencer-Timms,[224] on the same principle as the Magne-gage, except that the force required to detach the permanent magnet from the surface tested was measured with a beam scale and counter-weight. Price[225] proposed the use of the hydrochloric acid-antimony trichloride quantitative strip for determining the thickness of *terne (lead-tin) coatings* on steel by difference in weight, claiming that the amount of tin-iron alloy layer in terne plate is generally so small that no correction is necessary for the iron dissolved by the strip. Clarke,[226] who developed the BNF jet test, found that the lack of sharpness of the perforation point during the test for thickness *of zinc deposits on iron* could be overcome by applying a few drops of a solution of hydrochloric acid and potassium ferricyanide. Unfortunately, if perforation has not been reached, it is necessary to start the test again on a new spot.

Salt spray testing also had its space in the technical literature. Troendly presented a *manual of operation* for the testing equipment,[227] with instructions very complete in all respects, with the view of eliminating variations. As usual, no help was offered on the ever-present problem of variation in shape and position of the article, which accounts for most of the lack of reproducibility of results. Nixon[228] modified the test by *addition of acetic acid to the salt solution* and found that results on plated zinc-base die castings showed good agreement with exposure tests, using blistering as the indication of failure. Comparison of the *protective values of rust preventives* by determining the increase in weight due to rust formation in the salt spray was made by Pocock,[229] and a series of interesting tests were made by Hogaboom[230] on *stripped nickel deposits*. He found that a correct evaluation is not obtained when nickel plated steel is salt spray tested. The real value of a nickel deposit as a protective coating, he stated, could only be determined by testing the deposit itself after removal from the base.

Other papers presented during the year included one by Hughes[231] on the electrographic method of examining metallic surfaces for *identification and quality*, reagents being given for each coating, and another by Beiter,[232] who found that the *iodine coulometer* was quite accurate for measuring small currents. Mixing of the electrode products with resulting formation of potassium iodate, which would interfere with the accuracy of the coulometer, was overcome by adding hydrochloric acid to the electrolyte afterwards to decompose the iodate to iodine.

Miscellaneous

Removal of cyanides from plating room wastes was the subject of a paper presented by Friel & Wiest.[233] Chlorination was found to destroy the cyanide. A patent was granted to Nachod[234] on the *recovery of precious metals from wastes* by anion exchange, similar to the method used for purifying water.

The use of infra-red heat lamps for *heating small glass plating tanks* and an *agitator* for such tanks were described by LoPresti and Bandes.[235] Use of *high melting wax for stopping-off* gears to be copper plated for selective carburizing was discussed by Evans,[236] who covered the application of the wax and preparation of the surfaces. The proper *use and limitations* of these high melting waxes, which are generally chlorinated naphthalenes, was the subject of a paper presented by Richards,[237] who pointed out the toxic effects of the molten chlorinated waxes, especially from the fumes. *Localizing the deposit by stopping-off* part of the surface was the subject of a patent granted to Hampson.[238]

The *choice of plated coatings and basis metals* was discussed by Farber,[239] who itemized the costs of various finishing operations in typical articles, the *developments in the technical and patent literature* during the previous year were summarized by Hall and Hogaboom[240] and a patent was granted to Van der Pyl[241] on a method of *fixing abrasive granules to a metal backing* by plating.

Hoffman[242] added another patent to DuPont's collection on *molybdenum black* baths, this latest one on a solution of boric acid, a nickel salt and a molybdenum compound, and Batcheller[243] patented a method of producing a *design in color on stainless steel.*

The patent literature included new *glass electrodes* patented by Cary and Baxter,[244, 245] a *glass tank construction* claimed by Tarnopol[246] and an *electrical contact for wire* being treated continuously in electrolytic solutions, claimed by Rayburn.[247] *Plating control* was represented by an article by Kushner,[248] describing a simple, low cost, *automatic level control* for solutions, using a low voltage, sensitive relay, and by a patent granted to Freitag and Freitag on a *timing apparatus.*[249]

Plating racks and fixtures were relatively numerous in the patent literature. Saas[250] claimed a fixture with *auxiliary anodes*, Hampson patented an *adjustable rack*,[251] fixtures for *hollow articles* were patented by Saas[252] and by Kivley and Pearson,[253] Wanner[254] received a patent on a *hanger for a tubular member* and Graham, Smith and Williams[255] received one on a plating rack for *optical dies.*

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REGENERATIVE PLATING

AND OTHER APPLICATIONS OF POROUS DIAPHRAGMS AND CELLS

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THE use of cells and diaphragms in electrochemical processes is well-established in many fields of electrochemistry, but the electroplater has given scant attention to the possible improvements and benefits of such arrangements. Perhaps, with the increasing complexity of plating solutions, the demand for heavier and evenly-distributed coatings, the requirements which must be met in regard to the physical properties of the deposited metals, and the highly specialized plating problems which are commonly encountered today, the plater may view with alarm any suggestions which would, at the first glance, seem to make plating more complicated!

The organic chemist has used diaphragms extensively for the manufacture of organic compounds. Many organic compounds act as depolarizers when they are capable of reacting with the products formed by the discharge of ions. Such compounds can be cathodic depolarizers when they take up hydrogen or yield oxygen, or on the other hand anodic depolarizers when they are oxidizable. The use of hydrogen peroxide in nickel solutions to prevent pitting is an example of a cathode depolarizer. The oxidation of hydroquinone to quinhydrone in an acid solution is an example of an anodic depolarizer.

In electrolytic reduction, it is necessary to regulate the cathode potential through control of current density, temperature, electrode material, pH and other conditions. A substance reducible at a potential above that required for the liberation of hydrogen is not an efficient cathode depolarizer. The physical condition of the cathode, the velocity of depolarization and the catalytic influence of the cathode material or the catalytic effect of other compounds in the solution, all have an important influence on electrolytic reduction.

In general, the same conditions apply to electrolytic oxidation. The selection of the electrode material at which anodic depolarization takes place is somewhat more difficult because of dissolution of many otherwise satisfactory anode materials. The use of catalysts or oxygen carriers in electrolytic oxidation is often advantageous. Cerium, manganese, titanium and vanadium salts are most effective.

To prevent cathodic reduction of products formed at the anode, the anolyte and catholyte can be and, in most cases, must be separated by diaphragms. In some cases this can be accomplished by employing a cathode with a low hydrogen overvoltage. It can also be accomplished by employing a small cathode surface or by adding to the electrolyte a small quantity of chromate salts to lessen cathodic reduction, probably by the formation of a thin diaphragm of chromium chromate at the cathode face.

As an example of preventing cathodic reduction, it is possible to increase the metal concentration of an alkaline tin solution by using soluble tin anodes and using a cathode consisting of a small section of copper tubing. The tubing should be cooled by having water run through it. A high current density is impressed upon the small cathode surface and under these conditions little or no metal will be deposited, consequently the tin dissolved from the anodes electrochemically will remain in solution.

In dealing with solutions of ionized salts in contrast to organic materials, oxidation and reduction can take place by electrolysis as follows:

1. By a decrease or increase in the valence of the ion (e.g. borates to perborates)
2. By change of a cation to an anion and vice versa (e.g. manganese sulphate to permanganic acid).

It is not the intent, nor is it possible in this article to cover fully the theoretical background of electrolytic processes involving diaphragms. Several excellent text books on the subject of theoretical electrochemistry can be consulted by electroplaters whose attention to fundamental electrochemical theories has been overshadowed by pressing production problems which have beset them at every turn in this fast-moving period.

Porous cells, diaphragms and anode bags (which incidentally act as diaphragms under certain conditions) have many practical uses and are being employed by many electroplaters who have had little or no training in theoretical electrochemistry. Some of the important and very practical uses are:

1. Regenerative plating
2. Maintaining fixed anode-cathode distances
3. Overcoming excessive anode polarization
4. Reducing anode costs
5. Control of bath composition
6. Elimination of roughness from particles formed by anode corrosion
7. Preparation of an electroplating bath
8. Oxidation or reduction of constituents in the solution.

Regenerative Plating

Regenerative plating is simply the deposition of metal in a plating tank using insoluble anodes and replenishing the metal taken from the solution in a separate tank, using soluble anodes and an unplatable cathode. At first glance, such a system involving the use of multiple tanks might seem awkward and costly, but installations operating on this basis have demonstrated so many advantages that one can predict with certainty the expansion of such systems.

A printing concern heavily copper plating large gravure rolls in an acid copper solution was barred by wartime restrictions from purchasing copper anodes. As nearly one million magazines were printed each day, the situation was serious. Fortunately, the etched copper shell could be torn from used rolls but, when an attempt was made to use this copper as anode material, the following difficulties were encountered: (1) the anodes could not be made to conform to the shape

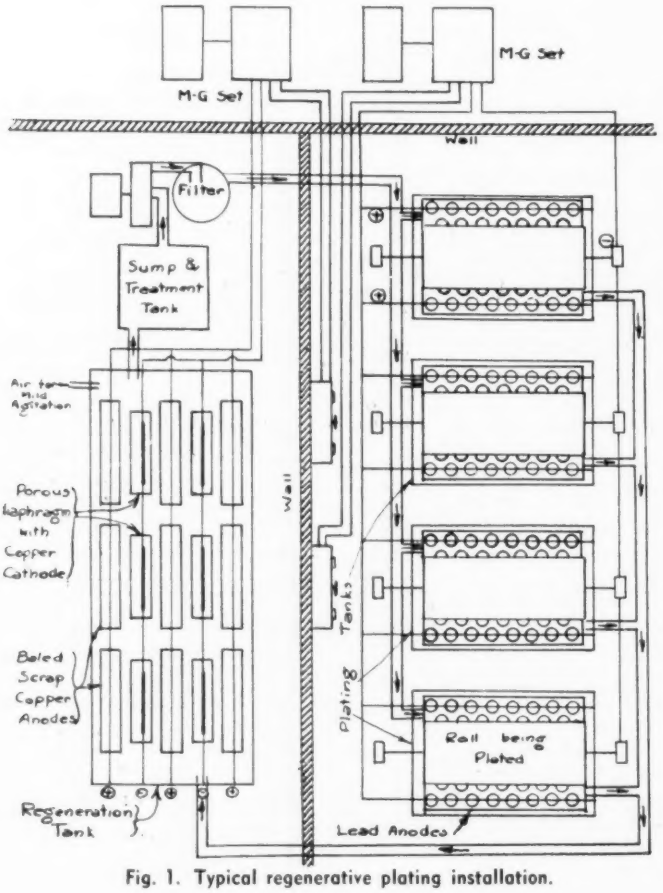


Fig. 1. Typical regenerative plating installation.

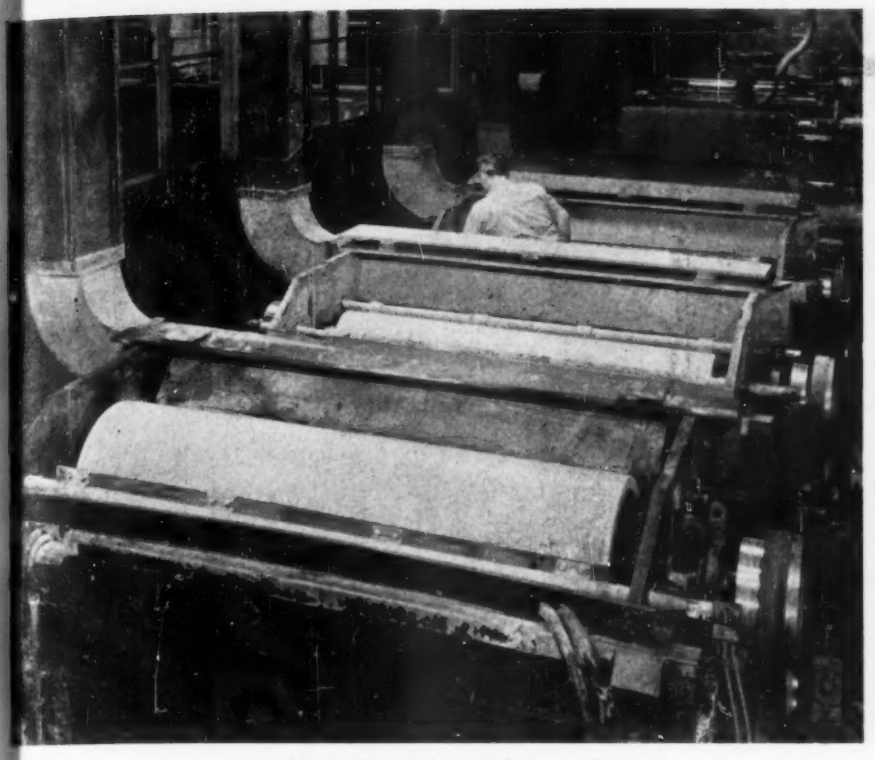


Fig. 2. Converted roll plating tanks.

the rolls; (2) rough deposits resulted from released anode particles; (3) the use of anode bags of sufficiently tight weave to hold back particles caused a restriction of flow of the copper solution and eventually, crystallization of copper sulphate developed within the anode bag; (4) the labor cost involved in replacing anodes was high; (5) ink residues in the etching pits adversely affected the structure of the electrodeposits.

In view of these difficulties, it was decided to install a regenerative system. A schematic diagram of this system is illustrated in Figure 1. Conforming silver-lead alloy anodes were installed in the four roll plating tanks on the right. The anodes were spaced about 1½" from the rolls. Holes were drilled in the anodes to promote good solution circulation. Moderate air agitation helped in this respect. Because of the liberation of oxygen gas at the insoluble anodes, ventilating hoods and tank covers were installed. Figure 2 shows the converted roll plating tanks.

In a separate room, actually some distance from the roll plating tanks, a regeneration tank was installed. This tank was fitted with three anode rods, two cathode rods and pipes for air agitation. Nine anodes of baled copper scrap were suspended from the anode rods and six ceramic porous diaphragms 2"x2"x3" were hung symmetrically from the cathode rods with vinyl-resin fabric slings. Copper cathodes were suspended in the cells. The cell and cathode arrangement is illustrated in Figure 3. The cathode compartment is filled with sulphuric acid. Eight to ten ounces per gallon of sulphuric acid is the minimum required to pass the maximum amount of current at a given impressed voltage. Acid concentration versus amperage is shown in Figure 4.

A sump and treatment tank completes the equipment in the regeneration room, which is illustrated in Figure 5.

As the rolls are copper plated, the solution is depleted in copper ions and the sulphuric acid concentration increases. The solution flows to the regeneration tank where copper is dissolved from the anodes. Because of the impermeability of the diaphragm, copper is not plated on the cathode. Hydrogen gas is liberated at the cathode. The solution then flows by gravity to a sump tank where it is treated with activated carbon and activated clay to remove ink residues. It then passes through the filter and the brilliantly-clear solution is pumped to the plating tank.

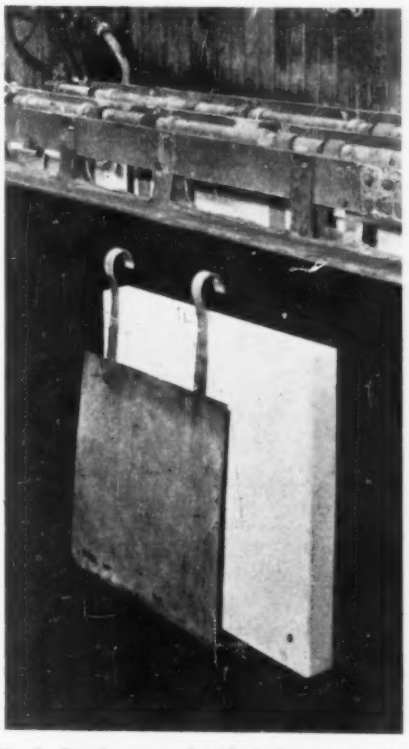


Fig. 3. Diaphragm and cathode for regenerative cell.

Each porous cell is capable of passing 500 amperes at nine volts. The six cells pass 3000 amperes at this voltage. An ideal diaphragm should pass the maximum amount of current or, in other words, have a low electrical resistance, and at the same time possess a structure permitting no ionic diffusion through the walls. Unfortunately, ideal diaphragms are not available; therefore a compromise diaphragm which has reasonable electrical conductivity and only a slight ionic permeability, must be used. Because some copper ions travel through the cell walls, a deposit of sponge copper is formed on the copper cathode and must be removed weekly. If the sponge copper touches or falls on the cell walls, it becomes bipolar and electrodeposition proceeds through the walls, eventually cracking the cells. This difficulty can be minimized by glazing the lower 8 inches of the cell or by providing wider spaces between the cathode and cell walls and also providing a sump under the cathode where the copper sponge can collect. A tank of this construction is shown in Figure 6. In this case flat porous diaphragms are fitted into grooved guides on the sides and bottom of a ceramic tank. The lower end of the diaphragm rests on a raised rib at least eight inches from the bottom of the tank. Ports are provided for cleaning sludge from the anode and cathode compartments.

A novel scheme is described by Savage and coworkers[1] for minimizing the difficulties caused by ionic diffusion. He proposes using a rotating disc as a cathode and presumably the copper sludge is scraped off above the solution level with a close fitting doctor blade.

As mentioned above, ceramic cells or diaphragms are used, although other materials such as parchment, special microporous rubber or other porous plastics and cypress wood or redwood will give satisfactory service in regenerating certain electroplating baths. Binai[2] reports the commercial use of diaphragms in cyanide solutions.

Advantages of System

Aside from using a regenerative system to meet an emergency situation caused by war conditions, there are advantages in this type of plating under normal conditions. When using soluble anodes in the roll plating installation described above, approximately 15% of the anodes purchased each year are figura-

[1] F. K. Savage, R. M. Fiandt, D. B. Reid & P. R. Pfefferle. *Proc. Amer. Electropl. Soc.* 173 (1944).

[2] W. R. Binai. *Metal Finishing*, 43, 144 (1945).

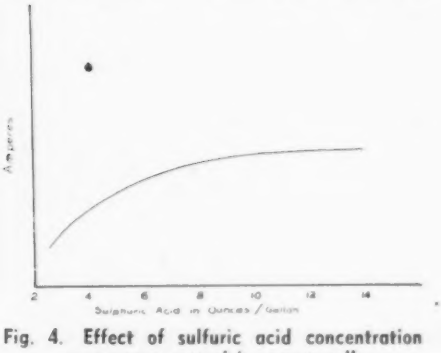


Fig. 4. Effect of sulfuric acid concentration on amperes passed in porous cell.

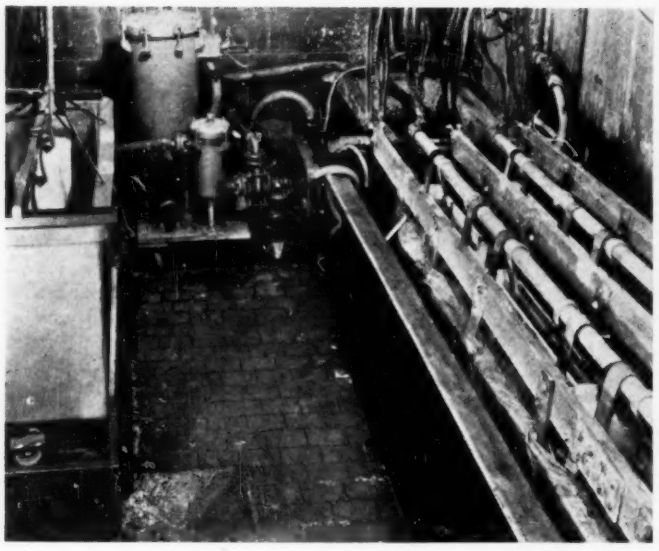


Fig. 5. Photo of regeneration room.

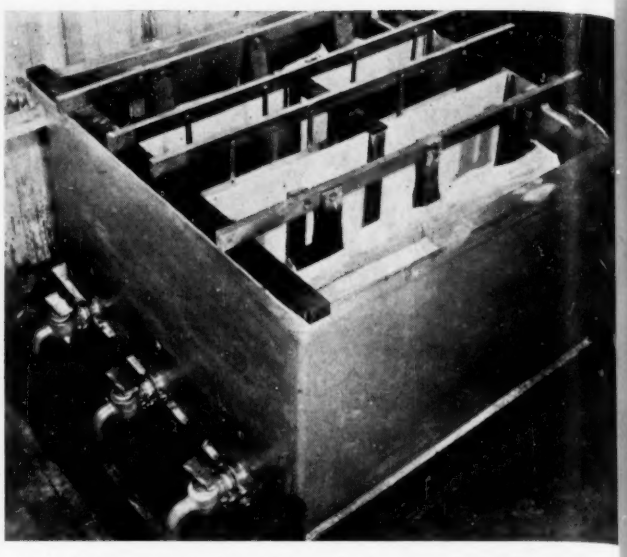


Fig. 6. Regeneration tank with flat diaphragms set into grooved guide

tively thrown away. Because of the difference in anode and cathode efficiencies, the metal concentration of the solution (the copper sulphate concentration) increases beyond practical limits. The amount of solution discarded to lower the metal concentration represents approximately 15% of the copper purchased. With the regenerative system the metal concentration can be stabilized at any given point by simply adjusting the field rheostat on the generator serving the regenerative tank.

Secondly, the metal cost is lower. Copper stripped from the rolls after the press run can be reused an infinite number of times. As some metal loss occurs through drag-out, spray and anode residues, a small amount of copper must be purchased occasionally. With the regenerative system, selected scrap copper serves as well as virgin copper anodes, with a saving of several cents a pound.

Again, there is a pronounced advantage in the regenerative system in that insoluble anodes are employed in the plating cell; consequently the quality of the deposit is consistently uniform and superior. All soluble anodes, no matter how carefully they are manufactured, may and usually do, corrode with the release of fine insoluble particles. Even when producing thin deposits, it can be demonstrated that insoluble materials in the plating bath cause porosity and microscopic roughness. These effects are accentuated when heavy deposits in the order of several thousandths of an inch are required. A sound structure is especially necessary where the metal is etched for the rendition of delicate tones in gravure printing. In the installation described, the use of insoluble anodes have materially reduced roughness. In addition to this improvement, a fixed anode-cathode distance and a fixed ratio are maintained, and the labor cost of disassembling the tank fixtures to replace worn, soluble anodes is completely eliminated.

In another installation, the details of which cannot be disclosed at present, it was necessary to maintain an extremely close anode-cathode spacing of approximately 2 mm. in a nickel plating bath. Previously, conforming nickel anodes were used, machined in the form of a tapered annular ring. After a few runs, the amount of metal plated from the anode increased the anode-cathode spacing beyond practical limits, necessitating the installation of new anodes. As the old anodes had only scrap value, the installation of a regenerative system and insoluble anodes effected considerable savings.

Diaphragms can be used for overcoming excessive anode polarization. There are always physical limitations to the extent of anode area which can be accommodated in a plating apparatus, and when employing soluble anodes in certain baths operating at high current densities, excessive anode polarization becomes a serious factor. Although soluble cyclic anodes can be employed to overcome this difficulty in some cases, the use of insoluble anodes and a regeneration system is feasible, as the anode current density on the soluble anodes in the regeneration tank can be maintained below the critical value because there are no space limitations in this tank.

It was pointed out above that the metal concentration of the copper plating solution can be regulated and changed, if necessary, by simply adjusting the current in the regeneration tank. Diaphragm cells are being used for controlling metal concentration in other baths, mostly alkaline cadmium and zinc solutions.

In the normal cadmium and zinc plating solution, the metal concentration tends to rise during operation because of appreciably higher anode efficiencies in relation to cathode efficiencies. During the recent war period platers were called upon to cadmium and zinc plate intricate ordnance parts, necessitating the use of insoluble auxiliary anodes. In some cases the areas being plated from insoluble anodes exceeded the areas accessible to soluble anodes and as a consequence the solutions rapidly became depleted in metal. In a specific case, a cadmium solution lost 1 oz./gal. of metal in a 20 hour period of operation. When an attempt was made to replace the metal with cadmium oxide, the sodium hydroxide, formed by the interaction of cadmium oxide with sodium cyanide, soon increased beyond reasonable limits. The use of a porous cell was suggested, and the problem was solved. A sheet steel cathode was suspended within the cell. The solution in the cell around the cathode was a mixture of sodium cyanide and sodium hydroxide. Typical arrangements are shown in Figures 7 and 8.

As an example, let us assume that a 400 gallon cadmium tank loses 0.25 oz./gal. of metal per 20 hour day. This is equivalent to a total metal loss in the tank of 100 ounces. Assuming the anode efficiency to be 100% the electrochemical equivalent will be 7.5 oz./100 ampere hours.

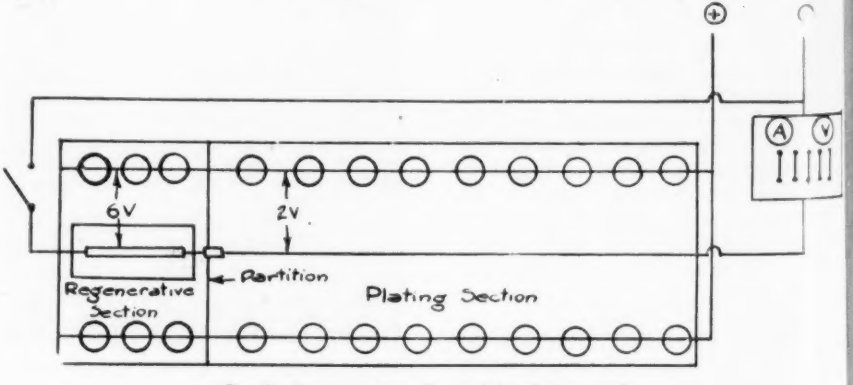


Fig. 7. Regeneration of metal in plating tank.

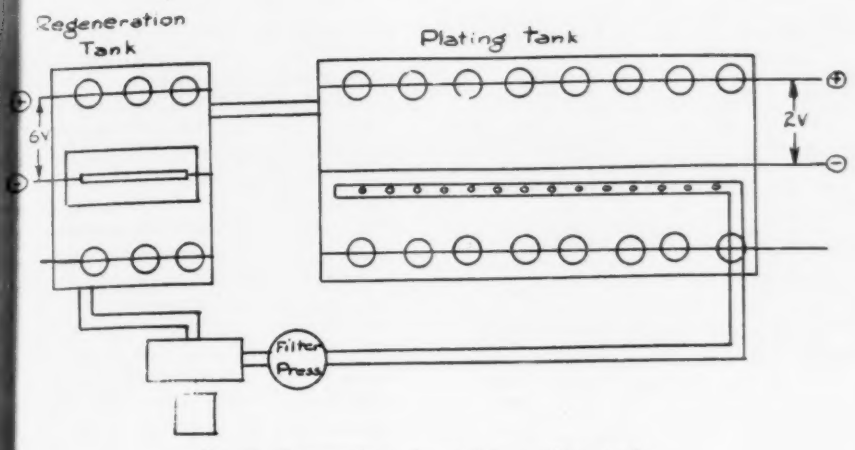


Fig. 8. Regeneration of metal in auxiliary tank.

A porous cell 2'x2'x3" will pass 125 amperes at 6 volts. It is evident that one cell will effect the introduction of 9.25 ounces of cadmium in the solution each hour, or 185 oz. in 20 hours. As 100 ounces of cadmium are required for replacement and as 185 ounces will be dissolved in 20 hours at 6 volts, the cell can be operated 10.8 hours out of the 20 hours or to accomplish the same purpose, the voltage can be lowered and the cell operated continuously at 67.5 amperes.

From the foregoing description, it is obvious that if the metal content can be increased, it is also possible to prepare a plating solution by the porous cell method. Gold platers have used this method for years. Lead-tin alloy solutions were prepared in this manner before tin fluoborate was available as a commercial chemical, by first making a lead fluoborate solution with a calculated excess of uncombined fluoboric acid and then using a porous diaphragm around the cathode. Tin anodes were placed in the tank and a sufficient number of ampere hours passed through the bath to obtain the desired lead-tin ratio in solution.

This method is also useful in investigating the effects of an anode material of uncertain history upon deposit characteristics. The anode can be dissolved electrochemically in a solution containing a calculated excess of the salt combining with the metal. The cathode in this case is enclosed within a diaphragm. One is thus assured that the deposits will reflect the effects of impurities in the anode. It is possible by this method to detect the presence of harmful impurities which can be determined in some cases only by the most careful chemical analysis or by spectroscopic examination.

Porous diaphragms or cells can be used for the oxidation of constituents in the electroplating bath. A classic example is the use of the Lukens cell in chromium plating solutions for oxidizing trivalent chromium to the hexavalent state.

Anode bags are not diaphragms by function or definition, but under certain conditions they may intentionally or unintentionally show a diaphragm effect. They exhibit characteristics of diaphragms to a slight extent, but usually the interstices between the woven fibers (porosity) are purposely larger to permit unhindered diffusion of metallic ions.

Anode bags are used primarily to prevent particles loosened by anode corrosion from being carried over to the cathode, thereby causing roughness and porosity of the deposits, lowered corrosion protection and difficulties in coloring or buffing.

Anode bags are made of various materials and in many different degrees of porosity. The choice of material, the construction of the bag and the degree of porosity which, in a fabric bag, depends upon the style of weave, depends upon the type of plating solution in which it is to be used, the temperature of operation, the rate of solution filtration, the type of agitation, if any, and most important,

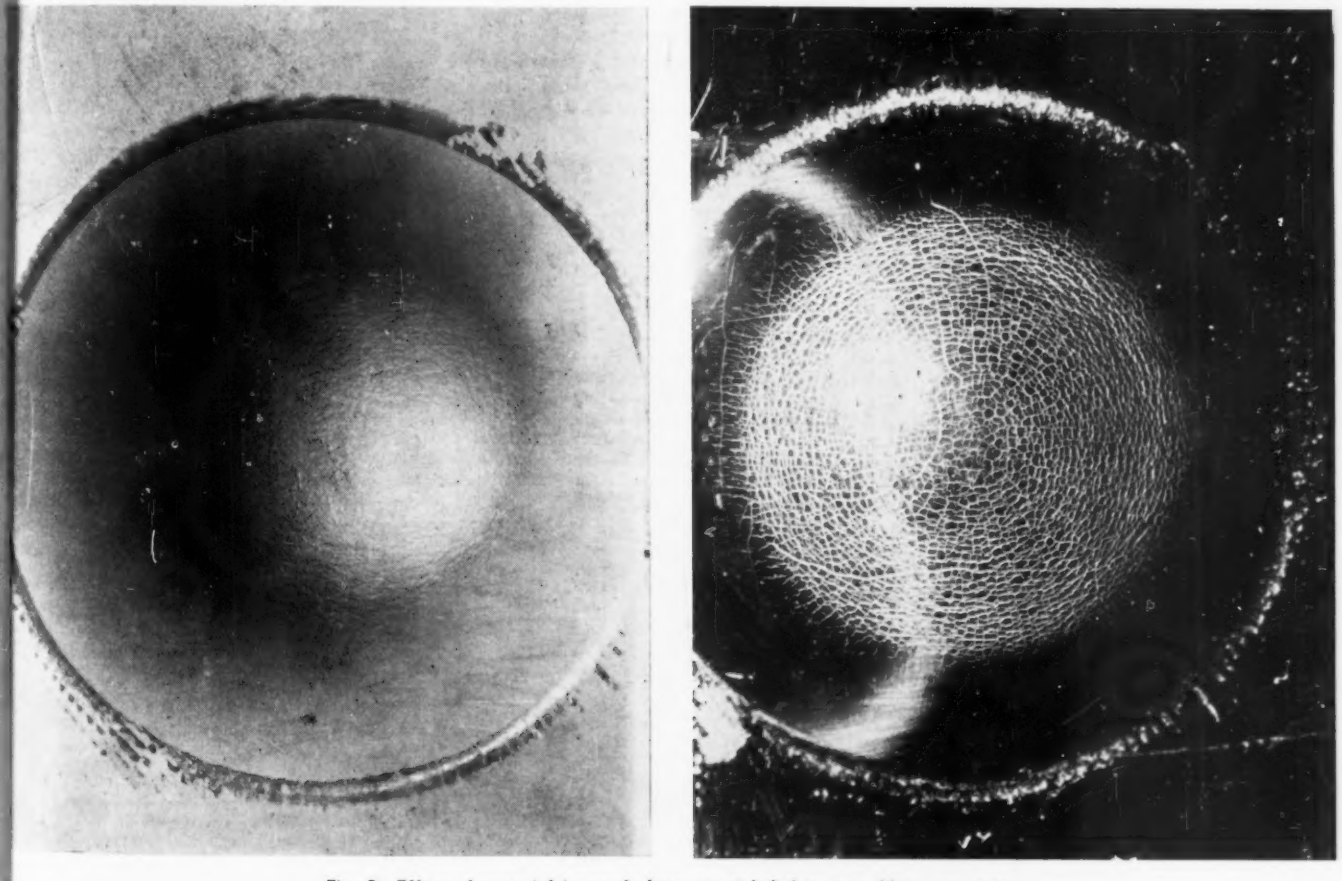


Fig. 9. Effect of material in anode bags on nickel deposits. Olsen cup tests
Left: treated anode bags. Right: untreated anode bags.

	Gurley Test Secs.	Final Cell Voltage	Zinc Conc. Change = Oz/gal.	Filtering Qualities	Weight oz/sq.yd.	Count	Plies	Weave
Unbagged		0.50	+0.3	None				
S-1	86.5	6.70	-1.6	Exc.	13.66	54x34	3x5	Plain
S-17	54.3	11.00	-1.1	Exc.	22.0	68x23.5	5x10	Plain
S-2	5.02	3.90	-0.7	Good	14.28	54x42.5	3x5	Chain Twill
S-19	1.60	0.50	-0.5	Good	14.28	54x42.5	3x5	Plain Twill
S-32	1.30	0.80	-0.2	Good	13.02	65x47	3x3	Chain Twill
S-28	1.03	0.50	+0.2	Poor	18.0	26x24	10x10	Chain Twill

Fig. 10. Anode bag characteristics in alkaline zinc solutions.

the type and corrosion characteristics of the anodes used.

Materials from which anode bags have been made are cotton, wool, asbestos, a combination of asbestos and rubber, woven glass, woven vinyl resins and paper. It is possible to manufacture bags from each of these fabrics in a seemingly infinite number of weights, weaves and porosities. Special bags are available such as "filter bags" which are constructed of two layers of muslin sandwiched around a single layer of high wet-strength filter paper. Another bag is made from a twill weave cotton, with the upper and lower portions impregnated with a synthetic plastic. The impregnation around the solution-air junction greatly prolongs the life of the bag, especially in low pH baths. The plastic pocket at the lower end provides a space for the collection of anode slimes which, in an untreated bag, tend to work through the fabric, especially in agitated solutions.

Anode bags must be carefully selected for a particular application. In the first place, the bag fabrics should not contain starch, sizing, sulphonated oils used in weaving or any other materials that would have an effect upon the plating solution and deposits. Ordinary washing of the fabrics is often not sufficient, and consequently special treatments have been developed. Figure 9 portrays a badly cracked nickel deposit resulting from using untreated anode bags. The flat panel was plated and then given a modified Olsen cup test which brought out a perfect spider-web facture pattern.

The weight of fabric and, what is more important, the type of weave must be chosen to effectively hold back the finest particles liberated at the anodes. For example, the weave must be tighter when using oxide-type nickel anodes than when using properly manufactured carbon type anodes; not that there is such a wide difference in particle size, as the fact that silicon present in the carbon-type acts as a binder and minimizes the free release of particles. The particles are easily detached from oxide-type anodes.

There are many types of fabrics that are tightly woven and most effective in holding back anode particles but they have high electrical resistance and low solution permeability. The high electrical resistance may increase by several volts the pressure required to maintain the desired current density.

A low solution permeability will cause concentration polarization within the bag compartment and lead to depletion of metal in the main portion of the plating bath. Occasionally, the diffusion is so poor as to cause a solution saturation within the bag and eventually crystallization of metallic salts.

Where anode efficiencies exceed cathode efficiencies such as in alkaline cadmium and zinc solution operated under certain conditions (without auxiliary insoluble anodes and with low drag-out) anode bags can serve other purposes than to withhold anode particles. By selection of suitable fabrics and weaves, a controlled concentration polarization can serve to equalize anode and cathode efficiencies and thus stabilize the metal concentration of the solution. Tests were conducted in alkaline zinc solutions using vinyl resin anode bags of various weights and types of construction. The results of these tests are illustrated in a tabular form in Figure 10 and graphically in Figure 11.

The solution containing the unbagged anode shows an appreciable increase in metal concentration at the end of a 24 hour run. The cell containing the S-1 bag, on the other hand, shows a considerable loss of metal. The cell voltage in this case is exceptionally high. The Gurley Test (seconds required for passage of 100 cc of air through cloth under standardized conditions) is also high, indicating high porosity of the fabric.

The solution in the cell containing fabric S-32 shows an initial loss in metal (probably caused by a time lag in saturating the fibers) but after a short period of operation the curve levels off and remains practically constant. In commercial operation bags made with S-32 fabric have compensated for differences in anode and cathode efficiencies and have made possible the operation of zinc and cadmium baths with practically constant metal concentration. At the same time, the use of the bags has eliminated defects and deposits caused by anode particles formed in large quantities when the anode current density is outside of the critical range.

Cells, diaphragms and anode bags have many uses and many more will be found. The electroplater is cautioned not to consider these arrangements as simplifications of plating processes, but once the principles are thoroughly understood and properly applied many difficult problems can be solved, production rates can be increased and monetary savings will result.

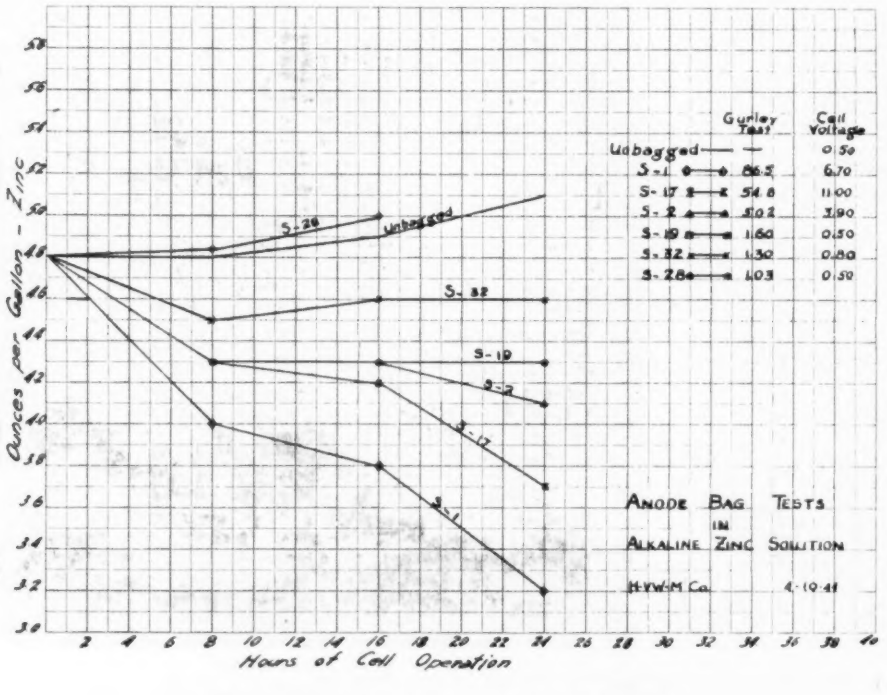


Fig. 11. Anode bag tests in alkaline zinc solution.

Acknowledgment

The author wishes to acknowledge the valuable suggestions and observations made by Mr. J. H. Molitor who supervised the installation of the regenerative copper plating system referred to in this article.

PROTECTIVE VALUE OF ELECTRO-TIN AS AN UNDERCOATING

By S. WERNICK, Ph.D., M.Sc.

Introduction

THIS work arose largely from some observations which were made in 1940 in connection with the protection of certain ferrous components which were required to withstand severe marine conditions on Admiralty equipment. The parts in question had to withstand such conditions for prolonged periods.

Initially, the finish specified was a coating of tin, which was subsequently replaced by a cadmium deposit. Cadmium ordinarily deposits fairly uniformly on steel surfaces, but it was found that the proportion of metal which reached recesses on intricate shaped components was insufficient to provide the necessary protection even though the thickness of deposit applied was much increased above the normal. It was thought that the provision of an electro-tin undercoating from a solution, the throwing power of which was superior to that of the cadmium cyanide electrolyte, might considerably improve the protective effect of the subsequent coating of cadmium. This, in fact, proved to be the case. At first a fair thickness of tin was deposited prior to the cadmium deposit, but it was found that this could be reduced quite appreciably without greatly affecting the ultimate degree of protection.

Later, when cadmium supplies fell off and it was desirable to change over from this metal to zinc as a protective finish, the same procedure was adopted and again it seemed from preliminary tests that improved results were effected by this means.

The somewhat striking effect of this thin undercoating of tin was such that it was thought desirable to carry out a systematic series of tests with a view to confirming the phenomenon generally, and further, to examine the causes of this effect.

Procedure

It was decided to employ a test piece which would be of simple shape but nevertheless representative of the more intricate type of work. To this end, a piece of sheet steel bent at right angles was employed as a standard test piece. The dimensions of the latter were 6" × 2", one end being turned up at a right angle at a distance of 2" from the end.

Specimens were identified by a number punched in the top corner and a piece of copper wire was soldered to each test piece to provide satisfactory electrical contact. The wire received the same deposit as the test piece, thus preventing the formation of any local electrocouple in the subsequent corrosion experiments.

It was decided to ascertain the effect of the tin undercoating on the following normal electro-deposited finishes:

(1) Zinc plating.
(2) Cadmium plating.
(3) Nickel plating.

The "normal" finishes were based on accepted latter-day practice, the respective thickness being as follows:

Zinc and cadmium	0·0003"
Nickel	0.001"

Additional to these thicknesses; 0.0004" and 0.0008" respectively were included in the cadmium and zinc finishes, since occasionally thicker deposits of this order are called for to resist "difficult" atmospheres. Comparative with the 0·0004" deposit of zinc and cadmium respectively, a composite deposit made up of 0·0001" tin and 0·0003" zinc was included, and similarly a composite of 0·0001" tin followed by 0·0003" cadmium in the cadmium group. The following deposits were therefore produced.

(*a*) ZINC GROUP.

(1)	Tin	0·0005"
	Zinc	0·0003"
(2)	Zinc	0·0003"
(3)	Zinc	0·0008"
(4)	Tin	0·0001"
	Zinc	0·0003"
(5)	Zinc	0·0004"

(*b*) CADMIUM GROUP.

(1)	Tin	0·0005"
	Cadmium	0·0003"
(2)	Cadmium	0·0003"
(3)	Cadmium	0·0008"
(4)	Tin	0·0001"
	Cadmium	0·0003"
(5)	Cadmium	0·0004"

(*c*) NICKEL GROUP.

(1)	Nickel	0·001"
(2)	Tin	0·0005"
	Nickel	0·0005"
(3)	Tin	0·0002"
	Nickel	0·0008"

All samples were deposited under such conditions that as uniform a deposit as possible was applied.

Exposure Tests

The corrosion tests to which samples were submitted were of three types:

(1) Hot Water Test.
(2) Intermittent Salt Spray.
(3) Outdoor Exposure.

The conditions in each of these tests are enumerated below.

All finishes were exposed in duplicate to each of these corrosion tests, and the care taken in producing as identical specimens as possible was fully justified in the remarkable similarity of results shown with all the duplicates.

The results obtained are listed below.

(1) HOT WATER TEST.

This is a simple test, but has nevertheless been found to be very effective. It comprises the immersion of the samples in a vessel containing distilled water; in these experiments the temperature was maintained at 80° C.

The samples remained immersed for a period of 24 hours and were then removed for inspection.

In the case of the zinc and cadmium deposits, both direct and composite, the corrosion resistance of the specimens withstood this test satisfactorily, the cadmium deposits in particular being largely unaffected. The degree of corrosion is insufficient to suggest that there is any superiority in the composite deposits.

The nickel deposits, however, were all found to have been attacked, the order of corrosion resistance being as follows:

No. 1.	Tin	0·0005"
	Nickel	0·0005"
No. 2.	Tin	0·0002"
	Nickel	0·0008"
No. 3.	Nickel	0·001"

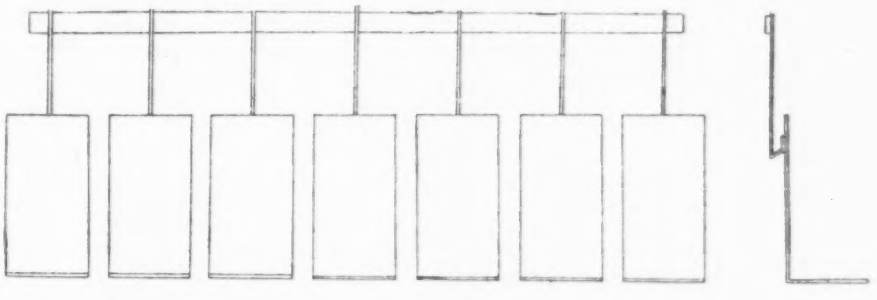


Fig. 1.

Paper presented to the Electrodepositors' Technical Society at the Northampton Polytechnic, London, E.C.1, and reprinted herewith by permission of the Society.

The specimens showed attack over most of the surface, but particularly, as expected in the bend.

(2) Salt Spray Test.

The specimens were exposed under the following conditions, the samples being removed as they approached a condition of considerable corrosion.

The test was conducted in a rubber-lined cabinet carrying a sump and injector at one end, which results in the spraying of droplets of a solution containing 10% sodium chloride. These droplets impinge on a glass baffle and are thus atomized so that the chamber is filled with a fog representing a concentrated saline atmosphere.

The solution resulting from the condensation of the fog is drained and removed and not used continuously but discarded after an initial contact with the samples. The samples were suspended as shown in Fig. 1. The spraying cycle consisted of a period of eight hours' spraying, followed by sixteen hours "off," when no spraying took place, but the samples remained in the salt atmosphere.

The samples were inspected periodically.

(a) Zinc Deposits.

Their comparative condition after more than 1,000 hours in the syray chamber was finally as is shown in Table I.

The state of the samples indicate quite clearly the beneficial effect of the tin deposit, whether present as a comparatively thin coating, i.e., 0·0001", or the thicker undercoating present in samples B.10 and B.11 where the undercoating represents over 50% of the total thickness of the composite tin-zinc finish.

It is particularly interesting to note that not only are samples E.31 and E.32, consisting of 0·0001" tin plus 0·0003" zinc, definitely superior to samples F.38 and F.39, the total thickness of which is 0·0004", but the samples are also superior to the test pieces D.24 and D.25, consisting of a pure zinc deposit actually double the thickness of the composite deposit. This result is therefore quite striking.

(b) Cadmium Deposits.

The cadmium group provides even more striking evidence of the value of the tin undercoating, as Table II indicates.

Once again the effect of the tin undercoating is found to be marked by increasing corrosion resistance. As with the zinc group, a total of half the thickness of composite tin-cadmium (tin 0·0001" plus cadmium 0·0003") is actually superior to a pure cadmium deposit of double the thickness, i.e., 0·0008".

(c) Nickel Deposits.

Results in this group again tend to support the findings referring to zinc and cadmium respectively. This is particularly interesting in view of the fact that nickel is cathodic, whereas both zinc and cadmium are anodic towards steel. The results are shown in Table III.

TABLE I.

Sample No.	*Nature*	*Condition of Sample*
(1) B.10	Tin 0·0005"	Considerable corrosion of the zinc deposit but
B.11	Zinc 0·0003"	rusting.
(2) D.24 } D.25 }	Zinc 0·0008"	Deposit has broken down on base of samples, sho ing some 50% rust.
(3) E.31	Tin 0·0001"	Zinc has corroded and rusting in bend and edge
E.32	Zinc 0·0003"	specimen only.
(4) F.38 } F.39 }	Zinc 0·0004"	Breakdown of deposit over whole of base, with ru ing. Worse than D.24 and D.25.
(5) C.17 } C.18 }	Zinc 0·0003"	Breakdown of deposit with considerable rusting.

TABLE II.

Sample No.	*Nature*	*Condition of Sample*
(1) H.52	Tin .... 0·0005"	The cadmium has been heavily attacked over whol
H.53	Cadmium 0·0003"	surface. One or two very small rust spots bend only.
(2) J.66 } J.67 }	Cadmium 0·0008"	Serious rusting in bend and horizontal portion specimens.
(3) K.73	Tin .... 0·0001"	Very few minor rust spots on horizontal part
K.74	Cadmium 0·0003"	specimen only.
(4) L.80 } L.81 }	Cadmium 0·0004"	Specimens show complete corrosion over whole su face, excepting only one small area on verti portion.
(5) I.59 } I.60 }	Cadmium 0·0003"	Similar to L.80 and L.81.

TABLE III.

Sample No.	*Nature*	*Condition of Sample*
(1) M.87 } M.88 }	Nickel 0·001"	Serious corrosion on bend, horizontal portion an edge of samples.
(2) N.94	Tin .. 0·0005"	Very few spots of corrosion on horizontal portio
N.95	Nickel 0·0005"	and bend.
(3) O.101	Tin .. 0·0002"	Mild corrosion in bend, horizontal portion and bac
O.102	Nickel 0·0008"	of samples.

TABLE IV.

Sample No.	*Nature*	*Condition of Sample*
(1) E.29	Tin 0·0001"	
E.30	Zinc 0·0003"	Some corrosion in bend.
(2) F.36 } F.37 }	Zinc 0·0004"	Corrosion in bend and horizontal portion.

TABLE V.

Sample No.	*Nature*	*Condition of Sample*
(1) M.85 } M.86 }	Nickel 0·001"	Considerable corrosion in bend, horizontal and ver cal parts, and back.
(2) N.92	Tin .. 0·0005"	Some corrosion in bend and vertical portions.
N.93	Nickel 0·0005"	
(3) O.99	Tin .. 0·0002"	Corrosion in bend, one or two rust spots on vertic
O.100	Nickel 0·0008"	portion.

These specimens were removed after 100 hours in the salt spray chamber, as their corrosion occurred much more rapidly than was the case with the zinc and cadmium samples.

The order of corrosion resistance is as follows, supporting the hot water test.

No. 1. Composite Tin-Nickel Deposit
Tin 0·0005"
Nickel 0·0005"

No. 2. Composite Tin-Nickel Deposit
Tin 0·0002"
Nickel 0·0008"

No. 3. Nickel alone ..... 0·001"

A point of interest here is that it would appear that the heavier the tin undercoating in a composite deposit of the same total thickness, the greater the apparent corrosion resistance of the finish. On the other hand this conclusion was not confirmed by the outdoor tests.

(3) Outdoor Exposure Tests.

The outdoor samples were exposed on a frame which was placed on the roof of a building in an industrial area.

Each sample was attached to a wire support, which was soldered to it on the back

The arrangement of the wire and attachment to the frame has been indicated (Fig. 1). The object of this is to obviate streaks, which are normally produced on exposed samples when a wire is directly attached to the top of the sample, causing water to drain down the specimen from the point of attachment. As a result, samples were usually free from streaking either on the back or front.

Samples were exposed for a period of some 25 weeks and were inspected at frequent intervals during this period. At the end of this time, their appearance was as indicated in Tables below.

In the main, both the zinc and cadmium samples withstood the outdoor exposure satisfactorily, but the nickel samples, as anticipated, showed quite a fair amount of corrosion.

(a) Zinc Deposits.

All deposits in this group stood up well, with the exception of the two specimens shown in Table IV.

The corrosion of the pure zinc sample was undoubtedly worse than that of the composite tin-zinc of equal thickness.

The remaining samples carrying heavier deposits of zinc will require further corrosion under atmospheric conditions before conclusive results materialize.

(b) Cadmium Deposits.

All deposits in this series have so far withstood corrosion satisfactorily, discoloration only occurring on the samples to date.

These again will require to be further examined before any conclusion can be reached.

(c) Nickel Deposits.

In this group the results were as shown in Table V.

While the results in the nickel group are not as distinct as the salt spray samples show, the composite deposits are nevertheless superior to nickel alone in corrosion resistance.

Castings.

The difficulty of plating castings is well known in the industry, particularly if the deposit to be applied is zinc.

To complete the series of experiments, it was therefore considered desirable to include some castings, the deposits applied being as follows:

(a)	Zinc	0·0004″
(b)	Tin	0·0001″ }
	Zinc	0·0003″ }

Duplicate samples of each of the above finishes were then exposed to the salt spray and to the atmospheric conditions outlined above, respectively.

The salt spray tests show marked improvement in the corrosion resistance of the sample resulting from the tin undercoating. The appearance of the outdoor samples tend to support the salt spray tests, as the composite deposits show little or no signs of rust, whereas the pure zinc deposits are already rusting.

This has been applied successfully in commercial practice where the specification calls for zinc plating on ferrous castings. On occasions, the direct deposition of zinc on such castings results in a very non-uniform coating, or even none at all, but the predeposition of a tin undercoating usually enables the zinc to deposit entirely satisfactorily. This application of the tin undercoating, therefore represents an important advance in the protection of ferrous castings.

Discussion of Results.

While all the corrosion tests have not been completed, some of the samples exposed to outdoor atmospheric conditions not having corroded sufficiently thus far, the general picture presented by the above results is clear enough and indicates that there is a marked improvement in corrosion resistance of a given deposit, whether this be zinc or cadmium and also, but not markedly, nickel, if the first thin layer of electrodeposit is substituted by a corresponding thickness of electrodeposited tin.

On the face of it, this is a somewhat surprising result, in view of the fact that tin is an electro-positive element in juxtaposition with ferrous material. There is therefore no tendency for this deposit to corrode preferentially and by sacrificing itself to protect the underlying ferrous material. Electrodeposited tin, as such, cannot adequately replace either of the electro-negative protective finishes which are commonly applied for rust preventing purposes, i.e., zinc or cadmium plating.

If, therefore, the tin undercoating does not improve the sacrificial function of the zinc deposit, the cause of its effectiveness must be sought for elsewhere.

There are at least two possibilities which may be considered.

The first is that the electro-tin coating has a close-grained structure and thus results in the deposition of a layer of metal which is relatively freer from pores than a similar layer of either zinc or cadmium. A deposit of such thinness is of course not pore-free, but might be considered to result in covering the greater part of the ferrous surface preparatory to the deposition of the zinc or cadmium. Probably this would be a helpful factor in increasing the corrosion resistance, but it does not appear likely that this alone would account for the marked improvement.

The second possibility is that the tin undercoating enables the deposit which is subsequently applied to be more uniformly distributed. In other words, it is possible

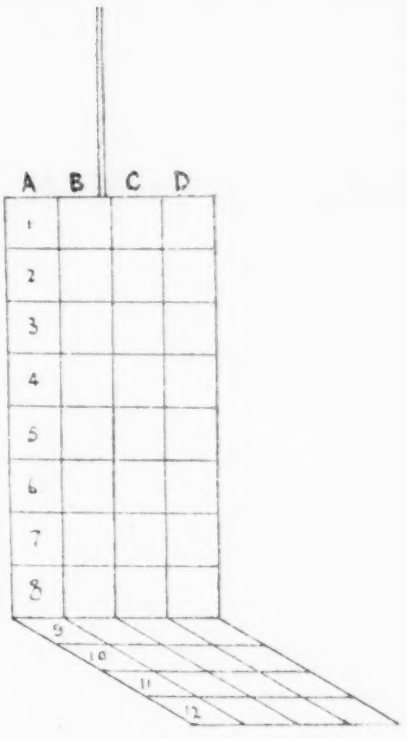


Fig. 2.

that it results in improving the covering power of the zinc or cadmium.

In order to determine whether there was any adequate basis to this theory, the following tests were carried out.

Samples similar in shape to those employed in the corrosion tests were plated under exactly the same conditions with both the zinc and cadmium deposits respectively, and alternatively with the composite deposits incorporating an undercoating of tin in each case; the total thickness was 0·0004″, the tin undercoating being 0·0001″.

The samples were then cut up into squares, as shown in the above diagram (Fig. 2). The thickness of deposit (or deposits) was then determined in the case of each small square.

Two methods were employed in determining the thickness.

(a) Clarke's Jet Test;

(b) Dissolving the deposit in a suitable chemical solution and determination of loss in weight.

The latter method was used for the composite deposits. The mechanism of determining the thickness which was adopted consisted in taking a given square of the test piece (which had already been stopped off on the rear to prevent dissolution from this area) and either jet-testing or stripping the deposits.

(To be concluded next month)

THIS IS WASHINGTON—

By George W. Grupp

METAL FINISHING's Washington Correspondent

December Baltimore-Washington Branch Tours Plating Plant The December meeting of the Baltimore-Washington Branch of the A.E.S. was the most sucessful monthly meeting in the history of the Branch. The meeting was attended by 113 persons who were all anxious to make the tour through the plating plant of the American Hammered Piston Ring Division of Koppers Inc. which specializes in porous chromium plating on piston rings. After an excellent turkey dinner in the plant's cafeteria, Bob Guerke, the plating superintendent of the plant, first gave the members a short illustrated talk on the plant's work and facilities, and then he and some of his assistants conducted the members through this modern plant, with the latest developed plating equipment, to enable them to see how this concern exercises care in preparing the work for plating and in maintaining the plating solutions. The members were enthusiastic in their praise of the plant and the type of work it is doing.

Annual Banquet Plans of Baltimore-Washington Branch The annual banquet of the Baltimore-Washington Branch of the A.E.S. will be held at the Maryland Yacht Club on February 16, 1946. Walter Olson is preparing an excellent educational program which will be headed by the A.E.S.'s supreme president, Walter Pinner, who will address the meeting on the subject of "Bright Nickel Plating at High Current Densities From High Chloride Ion Solutions." The banquet committee consists of Bradford Clark, and Jules Horelick with Frank Davey as chairman.

Research Fund Plans Formulated At a special session of the Baltimore-Washington Branch's Research Fund Committee, which consists of L. G. Tubbs, Dr. William Blum, T. F. Slattery, A. Brenner, and Ken M. Huston, the members formulated plans on soliciting sustaining members. During the past month eleven individual members each contributed five dollars toward the fund.

New Method of Measuring Gold Plate Developed at Standards Bureau The National Bureau of Standards has developed a method of ascertaining the thickness of gold plate on articles such as jewelry, brushes, combs, fountain pens and military insignia. W. Stanley Clabaugh of the Bureau's Chemistry Division developed the new method. The method is as follows: An area of one square millimeter is removed from the plated article by a special punch and die. The underlying base metal is removed with nitric acid after which the minute amount of gold is dissolved in aqua regia and the solution evaporated to dryness. The dry residue is treated with orthotolidine to produce a yellow color which is measured spectrophotometrically. The intensity of the yellow color determines the amount of gold present. "With an experimentally established curve," the Bureau states, "the quantity of gold in terms of percentage transmittance of light can be directly translated into thickness of gold layer. The method is so accurate that it is even possible to determine variations in the thickness of the gold layer."

Lead Foil May Be Used for Chromium Plating Lead quotas for tetraethyl lead have been reduced to 80 per cent of the estimated amount used in the fourth quarter of 1945 in amending Conservation Order M-38 on December 16, 1945. The new quota has been estimated to require about 12,000 tons of lead during the first three months of 1946. The amended order also provides that unused quotas of lead chemicals during any quarterly period cannot be added to the quota of the following quarter. The amended order now permits, during each quarter, the use of lead for experimental purposes up to 500 pounds; and it permits the use of lead foil for *chromium plating.*

Silver Plating Charges Increased By OPA Amendment No. 3 to MPR 581, effective December 17, 1945, provides that concerns which do silver plating under subcontract for manufacturers of silver tableware, jewelry materials and allied products may use the actual dollars and cents amount increase since September 21, 1945 in computing prices for their services.

Better Public Relations Are Needed By Management With strikes breaking out everywhere like an epidemic of measles, management should recognize that it must humanize its public relations methods to combat the new and effective propaganda methods used by the unions. Management must be as quick at making replies as labor is in making charges. Whenever management is slow in making a reply, awaiting the decision of the board of directors of the company, the unions use this time to their full advantage. Therefore, in the future some official of the company should be always ready to make a reply to any union charge or demand. Naturally, this means that management must be more alert as to what labor is thinking about to better the conditions of working men. Management must also think in terms of bettering the working conditions of labor. And in order that labor can better understand the problems of the company, management should make itself more available to employees to discuss both the problems of labor and management. The publicity of management should always be dignified, accurate, and sincere if it is to touch the hearts and heads of the workers and the public. Management must learn how to equal the ability of the unions to reach the headlines to tell the public what they

are doing for the welfare of labor, industry, and the public in general. And management must learn to keep itself better posted on what is going on in Washington and elsewhere to enable it to make quicker and more effective replies. And it must learn to be more willing to talk to the press to place its side of the story before the public.

Labor-Management Conference Unable to Agree on Major Issues The National Labor-Management Conference held in Washington failed to come to an agreement on the fundamental problems of industrial relations. As the conference was about to adjourn John L. Lewis, president of the United Mine Workers made this statement: "Management came into this conference knowing what it wants to do and went about its business effectively. Much of the time of this conference was taken up trying to harmonize labor's position. It is up to labor to unify its own policies and its leadership."

How Should Stockpile Be Created? Because of the serious drain on our resources of such strategic materials as lead and zinc the Senate Committee on Military Affairs has reported out of Committee the Strategic Materials Stock Piling Bill which provides that we build stockpiles of strategic materials from domestic production and encourage the development of new sources of supply within this country. On the other hand, before this bill is passed, it is not unlikely that opinions will be expressed that to conserve our remaining resources and to build up stockpiles of strategic material the United States should make heavy importations of these materials in peace times.

Depreciation May Be Changed to Care for Added Useful Life During the past month the majority opinion of the United States Tax Court ruled that the corporate depreciation allowable "for the open years on the basis of the shorter useful life should, we think, give way to that allowable under a computation based upon the corrected life span." In other words a company, whose basis for depreciation has been changed to give an increased useful life to property, may compute its depreciation for previous years on the basis of the increased life, even though no depreciation deductions were claimed in those years.

Research Without Politics Wanted The American Chemical Society went on record as endorsing the Magnuson bill which provides for the establishment of a national research board of experts appointed by the President without reference to political affiliations. The Society feels there should be no political control over the proposed Federal aid to scientific research.

SPA Means to Clear the Air Surplus Property Administrator W. Stuart Symington recently announced that all surplus government property disposal agencies must investigate complaints and information from any source indicating irregular or improper disposal of such property. In cases involving crime the Department of Justice will investigate and prosecute the guilty parties.

Excess Profits Tax Relief Claims Limited The Treasury Department recently issued a ruling barring corporations from claiming excess profits relief on additional grounds, once the original claim has been disallowed. In other words, disallowance of a relief claim, in whole or part, precludes a company from seeking relief on another basis than the original claim.

A $2,000,000 Fund Sought to Publish Scientific Data The American Chemical Society reports that if Congress does not appropriate $2,000,000 for the publication of the scientific data seized in Germany, and the results of American scientific efforts during the war, the reconversion program of the United States will be delayed. The Society feels that the publication of this information will be of tremendous benefit to American industry.

Inventory Control Revised Priorities Regulation 32 was amended on November 26, 1945 to provide specific inventory limitations on mica, cadmium, turpentine and vegetable waxes; a 30 day limitation on titanium pigments; a 60 day limit on white lead; and other changes.

Economic Pressure Retards Price Ceiling Decontrols Price Administrator Bowles stated recently that decontrolling of price ceilings is being delayed by increasing economic pressures. In fact he is of the opinion that price ceilings will again be restored on some commodities.

Restoration of Priorities Should Be Avoided If buyers do not stop pyramiding orders and expanding inventories excessively it will not be long before the Civilian Production Administration may restore selective priority controls to relieve reconversion bottlenecks. Already some directives have been issued offering priority assistance to certain industries. Supplies should be distributed on a voluntary basis because the restoration of priorities will be more harmful than beneficial.

Foreign Patents Will Soon Be Restored To Pre-War Owners The House has approved legislation which would return foreign patents to their pre-war owners. This action was taken after receiving letters of approval of such legislation from the departments of Treasury and States. In part, Secretary of State Byrnes wrote: "The Department believes that, under these circumstances, the status quo should be restored and the patents and copyrights should be returned to their former owners, subject to such liabilities or claims as would have existed had the Allied ownership continued through the period of the war." When this legislation is passed by the Senate, and signed by the President, the Alien Property Custodian will restore the patents to their owners; and Americans will then be able to engage in financial and commercial transactions with such patent owners.

RFC May Take Over Some SPA Functions There is considerable discussion going on in Washington to the effect that the Reconstruction Finance Corporation may take over the disposal functions of the Surplus Property Administration. This is possibly the result of divided authority between the Surplus Property Administration and the Reconstruction Finance Corporation in the disposition of many items of surplus. Consolidation of authority is believed by some to be the most effective way to dispose of surplus materials with despatch and with the least amount of confusion. If this consolidation takes place most of the staff of the SPA will be taken over by the RFC.

Employment Rising In November the number of employees in non-agricultural establishments increased for the first time since last March, according to the Department of Labor. But in spite of this increase which brought the total number of employed persons in non-agricultural establishments to 35,620,000, it is still considerably short of the number of persons employed in November 1944 when the total amounted to 38,347,000.

Small Business Problems Recognized By Senate Committee In the recent progress report issued by the Senate Small Business Committee it is pointed out that the problems which face small business in reconversion, in order of importance are (a) labor-management relations, (b) prices, (c) finance, (d) marketing and distribution, (e) materials and equipment procurement, and (f) technical advice. The report also states that "small enterprises must be preserved as a basic part of our economic structure." And "steps must be taken to make certain that persons desiring to establbish their own small business ventures have an opportunity to do so."

World Commodity Plan Is Being Worked Out In Spite of the discontinuance of the Combined Production and Resources Board and the Combined Raw Materials Board, the Government is working on an enlarged international basis for world commodity planning for a limited number of commodities which are still short. For example, a special committee of representatives of the United Kingdom, Canada, and United States will consider the supply and allocation of tin.

Patent Royalty Tax Eased The United States Tax Court in a recent decision held that the tax on patent royalties may be prorated back over the years during which the patent was being developed. In other words the tax on royalties need not be paid in a single year.

Compulsory Patent Licensing Believed Would Be Harmful To Small Business The proposed measures for compulsory licensing of patents were assailed by Robert Gottschalk, patent counsel for the Corn Products Refining Company. It is his opinion that compulsory licensing would destroy the incentive to invent, cause risk capital to go into hiding, and deprive small business of one of its most effective competitive weapons—exclusive patent rights.

Patent Office Is Setting New Standards The United States Patent Office has drawn up a program to improve its administrative procedures and to engage a larger number of higher paid personnel to insure a more thorough research before patents are granted. Commissioner Casper W. Ooms claims that "We in the Patent Office must find means to prevent the issuance of patents that find their only claim to validity in the presumption of validity that arises from their issuance." He is also of the opinion that there is need for the creation of a specialized tribunal to try patent cases because of the increasing technical complexities involved in such court actions.

Metal Supply As Viewed By CPA The Civilian Production Administration recently revealed that there continues to be a shortage of cadmium, corundum, and certain grades of mica and graphite. On the other hand it reports that there is an adequate supply of refractory chrome, cobalt, industrial diamonds, fluorspar, magnesium, mercury, molybdenum, tungsten, vanadium, aluminum, and columbium.

Martin-Dennis Leases Government Facilities The Surplus Property Administration has leased to the Martin-Dennis Company, for a period of five years, the Government's facilities in the company plant at Kearny, New Jersey. The equipment is to be used for the production of bichromate of soda.

The Zinc Situation The unfilled orders for zinc has steadily increased from 9,211 tons in August 1945 to 19,005 tons in November 1945. The production of zinc declined from 65,614 tons in October 1945 to 64,337 tons in November 1945. The shipments of domestic zinc during November 1945 amounted to 51,326 tons as compared with 52,052 tons in October 1945, and with 41,410 tons in September 1945. The zinc stockpile has increased steadily from 168,539 tons in April 1945 to 255,553 tons in November 1945.

Copper Shipments Are Increasing The shipment of domestic copper has steadily increased from 83,478 tons in September 1945 to 119,923 tons in November 1945. The stockpiles of refined copper has increased from 68,675 tons in September 1945 to 74,425 tons in November 1945. The production of crude and refined copper declined slightly in November when compared with October.

Lead Is Tight According to the Civilian Production Administration there will be a deficit of 60,000 tons of lead during the first quarter of 1946. During the fourth quarter of 1945 the Government stockpile had to be tapped to the extent of 25,000 tons; and a similar amount will have to be taken from this stockpile during the first quarter of 1946 to care for all essential needs. CPA officials state that the current demand for lead is at the rate of 1,000,000 tons per year. Due to an exhaustion of domestic deposits of lead we are dependent more and more on imports of this metal.

Price of Cresylic Acid Boosted Recently the British producers of Cresylic Acid advanced their prices by 2½ cents a gallon. This means that grade A now sells for 96 cents and grade B at 93 cents a gallon, c.i.f. New York plus the duty on the drums and the usual markups permitted by OPA.

Tin Again Under Control of M-63 To strengthen the international allocation of tin, which is still critically short, the Civilian Production Administration on November 30, 1945 again placed tin under the control of General Imports Order M-63.

Aluminum Shipments Are Dropping Due to the cancellation of military orders the shipments of aluminum have dropped 39 per cent since V-J Day, the Civilian Production Administration announced on November 29, 1945. The August shipments amounted to 104,200,000 pounds as compared with 170,200,000 pounds in July.

Colombia Is Good Market for Tinplate According to the Department of Commerce the Republic of Colombia, South America, is a promising market for tinplate without much foreign competition. The chief market is Barranquilla where Colombia's only converter is located.

Tin Restrictions Eased The Civilian Production Administration amended Order M-43 on December 17, 1945 to provide that solder with tin content up to four per cent may now be used in the repair and manufacture of passenger automobile bodies. The amended order has also relaxed restrictions on the use of tin which may be used in the production of kitchen equipment.

SHOP PROBLEMS

PLATING AND FINISHING
POLISHING — BUFFING
CLEANING — PICKLING
HOT DIP FINISHES

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Plating Room Construction

Question: Please send any information available on the construction of a plating room including tanks, drains, floors and walls. We are completely rebuilding our plating room and desire to use the best materials from the standpoint of wearing qualities and resistance to corrosion. Our work consists of gold and silver plating jewelry and novelties following base plates of bright copper and nickel.

Since we are already in the process of rebuilding the plating room, we would desire this information as soon as possible.

H. C. S.

Answer: We believe you will be interested in the information found in two articles by *Buechlin* on the subject of floors and drains, which appeared in the February and March, 1944 issues of *Metal Finishing*. We do not have any tear sheets of these articles, but the bound volume of *Metal Finishing* for 1944 is being forwarded to you as per your order and you can examine this article therein. We would suggest that you communicate with the various supply houses for information on tanks.

Recovery of Gold Drippings

Question: I would greatly appreciate any information you could give me on the material I might use as a floor covering near gold plating tanks. Such a material should readily absorb any gold drippings as well as have good wearing qualities. Furthermore, it should be inflammable, for it is planned to remove this covering periodically and recover the gold lost in the drippings.

Hard wood has been used in the past, but it does not absorb the drippings as readily as is desired.

G. C. S.

Answer: In our opinion, there is not enough gold in the drippings to warrant pulling up a floor at regular intervals. If you are operating with a concentrated gold solution, drag-out tanks should be used to save the gold.

Immersion Tinning

Question: We understand that there is an immersion tinning process in use in the United States which operates with an alkaline solution containing caustic soda, stannous chloride, and sodium cyanide.

It is believed that this solution is capable of giving good bright deposits on copper and brass when suitably used.

We have made an extensive examination of records and technical literature in this country, but have failed to find reference to this particular solution. We should, therefore, be very grateful if you would send us either technical information about the solution, or alternatively refer us to published works on the subject which are likely to be available in this country.

R. C. B.

Answer: We would suggest the following:

Water	1 gal.
Stannous chloride	2 oz.
Caustic soda	2½ oz.
Sodium cyanide	1 oz.
Time	twenty minutes minimum
Temperature	boiling
Container	iron basket

The solution can be controlled by standard methods of analysis but is usually maintained by additions of caustic soda and sodium cyanide. The reaction is a chemical displacement in which the brass dissolves and precipitates tin on the surface.

Removal of Rust

Question: We are engaged in the construction of steel tanks for fermentation and storage of beer. One of the problems is the removal of the rust and scale formed on the surface of these tanks, which in turn prevents the adhesion of paints or coatings used as protectives.

Your publication was recommended to us as the best source of information regarding the methods of removing such undesirable scale.

L. M.

Answer: If the tanks are already assembled, we would suggest flame priming before painting. Information is obtainable from Linde Air Products Company, 30 East 42nd Street, New York City. If the rust and scale are to be removed before assembling the tanks, you will probably find it more economical to install an acid pickling unit.

Electrolytic Polishing

Question: We would like as much information as you can give us on electrolytic polishing and how it compares in cost per square foot with mechanical polishing; how much equipment is needed and firms that can furnish us with same.

We became interested in the process after reading your article in the July 1945 issue by Mr. Otto Zmeskal.

M. C. N.

Answer: Electrolytic polishing is cheaper than mechanical polishing but does not produce the same type of finish. The finish is similar to that obtained by acid bright dipping brass, and is generally used on recessed articles where wheels cannot reach. It is often used as a pretreatment for mechanical polishing.

Equipment may be obtained from a local plating supply house, the type being determined by the particular solution employed.

Tin Flowing

Question: We are making an effort to obtain all available information, patents, etc. on the "fusion of electro-plated tin on various materials by immersion in heated oil."

We will deeply appreciate any information you may give us on this process, or any references to other authoritative sources where we may obtain additional information.

J. L. W.

Answer: A number of patents have been issued on this subject and we would suggest that you examine the patent literature. Some information may be available thru the Tin Research Council, Battelle Memorial Institute, Columbus, Ohio.

Dissolving Silver Cyanide

Question: I would like to know how much potassium cyanide would be needed to dissolve silver cyanide.

A. A.

Answer: One half oz. of potassium cyanide will dissolve one oz. of silver cyanide.

Electroplating on Magnesium

Question: We will deeply appreciate any information you may give us regarding methods of electrodeposition of copper, nickel, chromium, or other metals on magnesium and magnesium alloys.

References to other authoritative sources, including published literature, where we may obtain additional information, will be gratefully received.

J. L. W.

Answer: The following may be referred to:

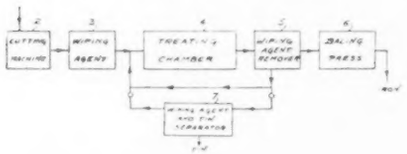
W. S. Loose, Trans. Electrochemical Soc. 81 (1942).

U. S. Patent 2,313,756 (March 16, 1942).

Patents

Detinning Process

U. S. Pat. 2,386,970. J. P. McCoy, assignor of one-half to Milwaukee Tool & Die Co., Oct.



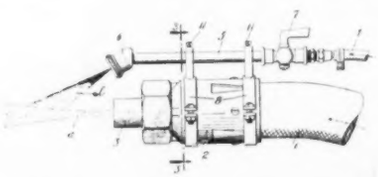
16, 1945. The method of detinning tin coated ferrous metal, which comprises, simultaneously constantly agitating and heating the coated metal to a temperature sufficient to plasticize only the tin coating while subjecting the softened coating to the rubbing action of silica gel in quantities only sufficient to remove the tin and while also maintaining the removed tin constantly concealed from atmosphere within an abundance of wood sawdust mixed with the silica gel in quantities sufficient to prevent oxidation of the tin and ferrous metal, and thereafter removing the tin in granulated condition from the mixture of silica gel and sawdust.

Vacuum Metallizing

U. S. Pat. 2,387,970. P. Alexander (England), Oct. 30, 1945. In a process of depositing on a support a bright film of a metal, selected from the group consisting of gold, nickel, cobalt, iron, copper, aluminum, chromium and silver, which is deposited by thermal evaporation in a vacuum, the steps of continuously maintaining liquid a mixture of a metal, selected from the group consisting of platinum and palladium, and a small percentage of the said metal to be evaporated, exposing said support to the vapour from said mixture, and maintaining the percentage of said metal to be evaporated approximately constant in said mixture by feeding the metal to be evaporated into the said mixture at a rate equal to the rate of evaporation of said metal to be evaporated.

Sand Blasting

U. S. Pat. 2,387,193. W. H. Swenarton, Oct. 16, 1945. The method of removing coat-



ings from metal surfaces by sand-blasting, which comprises projecting a high pressure blast of air and sand through a blast nozzle and directing it against the objective metal surface while causing a very fine mist-like spray of aqueous liquid under pressure and flowing at a rate in excess of four gallons per hour but insufficient to create ripplets flowing over such surface to intersect such blast beyond said nozzle and prior to its impact with such surface.

Rust Prevention

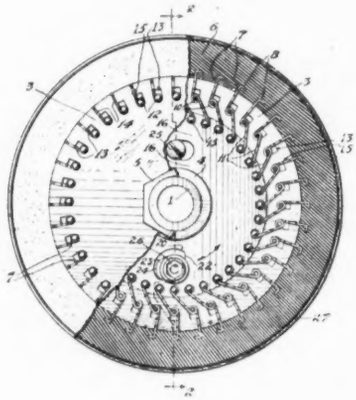
U. S. Pat. 2,387,323. J. W. Gaynor, C. N. White and R. W. Watson, assignors to Standard Oil Co., Oct. 23, 1945. A composition of matter comprising a major proportion of an oil and a minor, corrosion-inhibiting proportion of an amidoxime.

Burnishing Tool

U. S. Pat. 2,387,453. W. E. MacGuire and K. J. Dodge, assignors by mesne assignments, to Frank B. Yingling, Oct. 23, 1945. A self oiling burnishing tool comprising a hollow shank, a hollow handle on said shank and having its interior in communication with the interior of said shank, a cap for the end of said handle, a valve for closing the free end of said shank, a valve stem attached to the valve and extending through the shank and said handle, a burnishing tip member removably mounted on the free end of the shank and having an axial bore for communication with the hollow shank when the valve is open, and a transverse bore connecting with the axial bore, and means manually operable from the exterior of the handle and for opening said valve.

Abrading Wheel

U. S. Pat. 2,387,296. G. W. Rochwald, Oct. 23, 1945. A wheel of the character de-



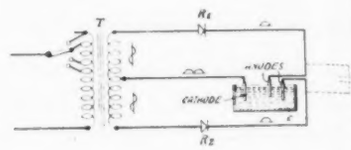
scribed, comprising a body, a plurality of radially movable thrust members mounted on said body, an expansible rim to which one end of each of said thrust members is connected, and means for simultaneously actuating all of said thrust members radially in opposite directions to expand and to contract said expansible rim respectively including an actuator rotatably mounted on said body coaxially with said rim, and a link pivotally connected to each thrust member and to said actuator so that said links will be actuated longitudinally outwardly and inwardly upon rotation of said actuator in opposite directions respectively.

Inhibitor for Carbon-Tetrachloride

U. S. Pat. 2,387,284. E. O. Ohlmann, assignor to The Dow Chemical Co., Oct. 23, 1945. A method of inhibiting the corrosion of metals by wet carbon tetrachloride in contact therewith, which comprises dissolving in the carbon tetrachloride at least 0.1 per cent by weight of rosin and from 0.001 to 0.1 per cent by weight of a primary mono-amine.

Electrodeposition Method

U. S. Pat. 2,387,772. S. Ruben, Oct. 3, 1945. The method of substantially simultaneously electrodepositing a plurality of different metals upon a body which comprises making said body the cathode in a plating bath containing, in addition to said cathode, a plurality of anodes corresponding to said different metals, applying alternating current in different phase to half-wave rectifiers connected respectively to said anodes, so that said anodes are consequentially charged to positive polarity, and applying pulsating negative direct current voltage to said cathode.



Determination of Hydrogen in Steel

U. S. Pat. 2,387,878. W. D. Brown, assignor to Carnegie-Illinois Steel Corp., Oct. 30, 1945. Testing apparatus for determining hydrogen in steel, which comprises the combination with a heating furnace for heating a sample of steel being tested, of a mercury reservoir, interconnected measuring tubes immersed in the mercury reservoir, one of the said tubes being adapted to receive a sample being tested and to measure gas evolved therefrom during the testing, means enabling air to be evacuated from the measuring tubes, and means for maintaining a Torricellian vacuum in the said tubes.

Corrosion Prevention of Magnesium

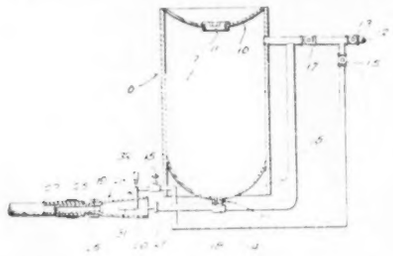
U. S. Pat. 2,387,494. C. J. Bushrod, assignor to Magnesium Elektron Ltd. (England), Oct. 23, 1945. A process for improving the resistance to corrosion of magnesium and magnesium base alloys, which consists in subjecting the metal to a treatment with an aqueous solution of components which when first prepared consist of at least 10 parts of a substance selected from the group consisting of sodium bichromate and potassium bichromate and from 6 to 10 parts of concentrated nitric acid to 100 parts of water.

Detergent Composition

U. S. Pat. 2,387,572. L. H. Flett, assignor to Allied Chemical & Dye Corp., Oct. 23, 1945. An improved detergent composition comprising alkyl aryl sulfonates, the alkyl side chains of which are derived from a kerosene fraction at least 80% of which boils within the range of 180° to 300° C., and a water soluble salt having an inorganic cation selected from the group consisting of water soluble sulfates, sulfites, thiosulfates, chlorides, dihydrogen phosphates, borates and acetates, the amount of said water-soluble salt having an inorganic cation being such that the sulfonate-salt mixture contains between about 40% and about 65% by weight thereof.

Sandblasting

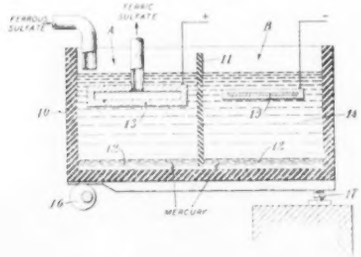
U. S. Pat. 2,388,818. E. C. Bick, Nov. 13, 1945. In a structural assemblage of the class described, a container constituting a



sand-holding and delivery hopper, a valved compressed air pipe connected with said hopper to force sand therefrom, the hopper being provided at its lower end with a discharge for the sand, a by-pass pipe having a vertical branch connected with the compressed air pipe and having a horizontal branch connected with said sand discharge, a single valve in said compressed aid pipe adjacent said by-pass to permit air to circulate through the main compressed air pipe into the hopper, and a predetermined portion to circulate around and through the by-pass, and a reducing adapter provided with a delivery hose, the adjacent end of said by-pass being connected with said adapter, and a direct air supply pipe connected by a valved connection with said compressed air supply line and also connected at its opposite end with said adapter, this by way of a yoke-like device having branches piercing and entering diametrically opposite sides of the adapter and terminating in nozzles to feed air in a direction toward the discharge end of said adapter.

Pickle Recovery

U. S. Pat. 2,389,691. E. A. Schumacher and G. W. Heise, assignors to National Carbon Co., Inc., Nov. 27, 1945. A continuous process for treating an acidulous aqueous solution of ferrous sulphate containing 0.5% to 5% free sulphuric acid to produce iron and a solution of ferric sulphate which comprises the steps of electrolyzing such solution as an electrolyte in contact with a mercury cathode in which iron is deposited, and a porous carbon anode at which ferrous sulphate is oxidized to ferric sulphate; withdrawing through said anode anolyte containing said ferric sulphate; removing the iron-containing mercury from



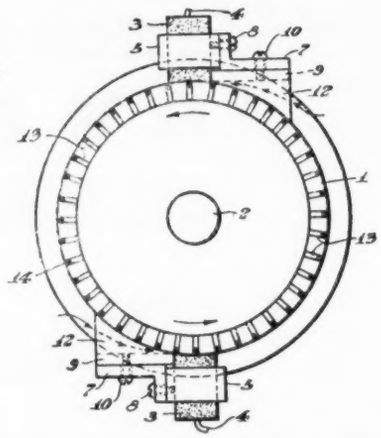
contact with said electrolyte; electrolyzing an iron-sulphate containing second electrolyte, in which the concentration of free sulphuric acid is about 0.01 N to 0.02 N in contact with said iron-containing mercury as an anode, and an insoluble cathode, thereby stripping iron from the mercury and depositing iron on the last mentioned cathode; and returning mercury from the last-mentioned step to the first-mentioned step of the process.

Plating Baths

U. S. Pat. 2,389,179. H. Brown, assignor to The Udylite Corp., Nov. 20, 1945. In a process of electrodepositing metals, the step which comprises electrolyzing an aqueous acid solution of a salt of the metal to be deposited and a minor proportion of a soluble sulphate of a water-soluble aliphatic polyhydric alcohol partially esterified with a fatty acid containing from 12 to 14 carbon atoms, the metal to be deposited being selected from the group consisting of nickel, cobalt, iron, zinc, cadmium, copper, and antimony.

Electric Brush

U. S. Pat. 2,389,214. E. I. Shobert, II, assignor to Stackpole Carbon Co., Nov. 20, 1945. The combination with a commutator having segments separated by circumferentially spaced slots, and an electric brush contacting the commutator, of an air de-



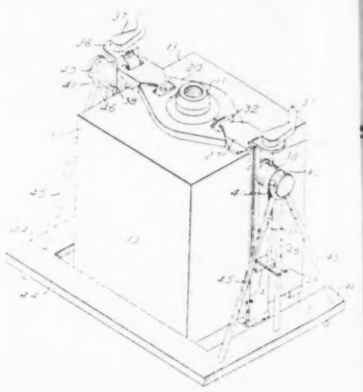
flecting and conducting member extending away from the entering side of the brush and having laterally spaced side walls substantially engaging said commutator, whereby a stream of air is directed against the contact surface of the commutator where it starts to engage the brush, and means filling the end portions of said slots to prevent said air from escaping from between said side walls.

Roll-Changing Apparatus

U. S. Pat. 2,388,980. C. J. Klein, assignor to National Steel Corp., Nov. 13, 1945. Lifting apparatus for use in an electrolytic coating line or the like wherein electrolyte pans are disposed in vertically spaced tiers and contact rolls are disposed between adjacent pans and journaled in spaced housings, the parts in the upper tier precluding the use of a mill crane for handling the rolls of the lower tier, said apparatus comprising a hoist and a rail on which it travels, said rail being below the pans and rolls of the upper tier and extending above a set of rolls in the lower tier and laterally thereof to a point relatively free from overhead obstructions.

Carboy Tilter

U. S. Pat. 2,389,482. M. Bixler, Nov. 2, 1945. A clamp for a carboy box of the ty



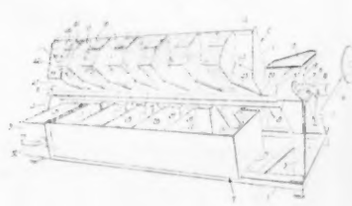
having spaced supports on the bottom thereof for respectively engaging sustaining surfaces, comprising a base dimensioned to pass under the box between the supports without necessarily tilting or raising the box relative to such sustaining surfaces, standards attached respectively to the ends of said base, one of said standards at least being detachable, hook means on each standard, a head plate across the top of the box, latch levers respectively pivoted to said head for engaging said hook means, and means for locking said latch levers in holding engagement with said hook means.

Treating Brushes

U. S. Pat. 2,388,867. R. O. Peterson, assignor to The Osborn Mfg. Co., Nov. 13, 1945. In a method of treating brush bristles for use in rotary and like brushes, the steps which consist in applying to such bristles a viscous tacky substance of the type which wets such bristles, combined with a solvent therefor, and thereupon evaporating such solvent whereby the bristles are left with a coating of such tacky substance.

Tumbling Machine

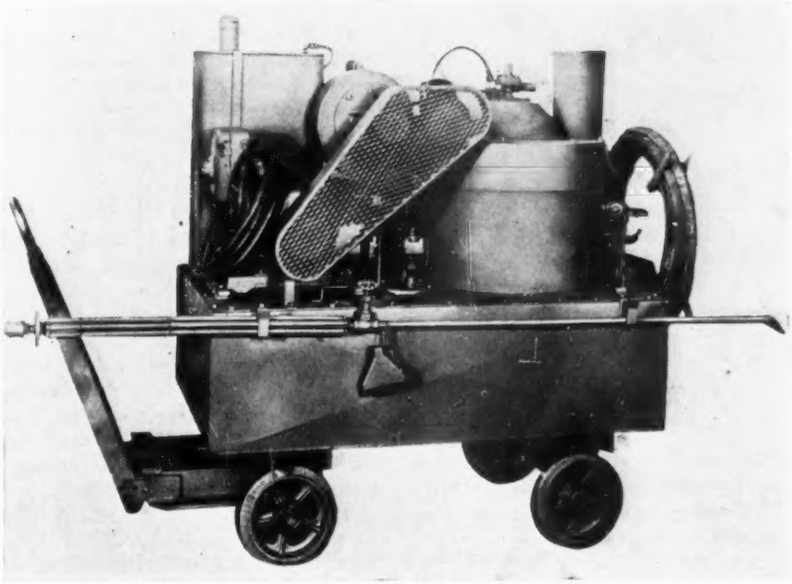
U. S. Pat. 2,389,337. E. R. Zademach, assignor, by mesne assignments, to Metalwash Machinery Co., Nov. 20, 1945. In a tumbling machine for treating material, the combination of a conveyer having an axis, a plurality of pockets secured to said conveyer on one side of said axis, a plurality of pockets secured to the conveyer on the other side of said axis, means for causing the material to



pass from a pocket on one side of said axis to one on the opposite side thereof upon oscillation of said conveyer, tanks adapted to contain treating fluids and disposed in the paths of certain of said pockets and means for oscillating said conveyer.

NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY



Steam Cleaning Unit

To meet the exacting demands of modern industry for faster, better cleaning at lower cost, Oakite Products, Inc., has developed a new, quality-engineered, multiple-duty steam cleaning unit known as the Oakite-Vapor Cleaning Unit.

This unique unit is a self-contained, down-draft flame, oil-fired, enclosed coil-type steam generator that delivers hot vaporized cleaning solutions under selective pressures up to 200 lbs. for the speedier, easier removal of grease, grit, grime, paint and other deposits from surfaces. A wide range of fuel oils such as No. 1, No. 2 or No. 3 fuel oil, kerosene, or gasoline, may be used to operate the unit. Due to its flexibility of steam pressures, the unit may be used on many different types of light and heavy-duty cleaning.

Extremely rugged in construction, only the highest quality materials are used in the manufacture of the Oakite-Vapor Cleaning Unit. Built for long, continuous, trouble-free service, the unit has tremendous reserve power and operates without vibration. Many new exclusive features are incorporated that provide for simplicity and ease of operation and maintenance, rapid steam generation, unusual solution tank capacity, effective operation of two steam guns simultaneously, wide flexibility in its application to various cleaning operations, safety against fire (A.S.M.E. safety code standards are fully met) and other advantages.

Free descriptive folder on the new Oakite-Vapor Cleaning Unit is available upon request to Oakite Products, Inc., Dept. MF, 16 Thames St., New York 6, N. Y.

pH Test Papers

Six new Hydrion Short Range pH Test Papers are announced by R. P. Cargille, Dept. MF, 118 Liberty St., New York 6, N. Y. Color changes for small pH intervals are so well defined with these papers that readings can be made to 0.25 pH. The six papers cover the range pH 1 to 14. Transparent plastic dispenser holds two papers in roll form. These new Short Range Papers supplement the original Hydrion Wide Range Papers and are a useful supplement to any other method of determining pH.

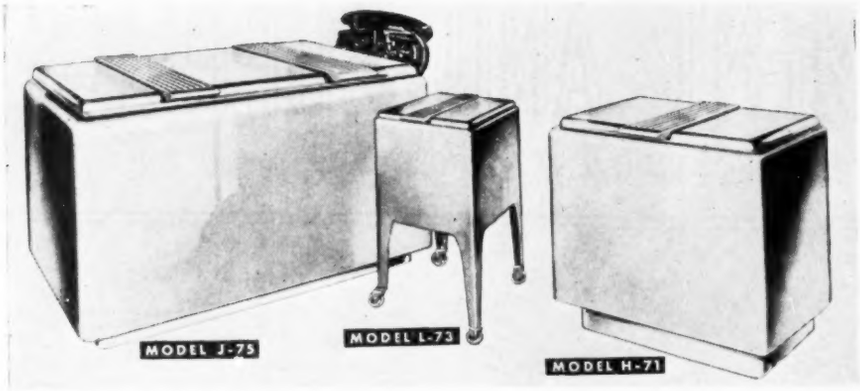
Any two papers needed for special purposes available in a dispenser at $2.00, or the complete set of Short Range and Wide Range Papers with refills, is furnished at $13.50.

Stripping Agent

Sulphur Products Co., Inc., Dept. MF, Greensburg, Pa., has announced a new product known as McKeon's "Tin Strip." This product is claimed to be a simple, efficient, fool-proof liquid for stripping tin from steel, iron, brass, etc. The solution, used hot, is as follows: 10 ounces of "Tin Strip" mixed with 10 ounces of caustic soda and sufficient water to make one gallon.

Further information may be obtained by writing to the company at the above address.

PROFESSIONAL DIRECTORY



Parts Cleaning Systems

Gray-Mills Co. announces three new parts cleaning systems for industrial plants.

Model H-71 is a general utility unit—successor to Gray-Mills Model P-70. The new unit incorporates a centrifugal pump which is used for hose-cleaning parts and for agitating the fluid to accelerate the cleaning of either large parts or small parts cleaned in baskets. A means for air agitation is also provided. A safety device causes the cover to close automatically in case of fire. The overall size of this model is 38″ long, 34½″ high, and 21″ wide.

Model J-75 is 60″ long, 34½″ wide, and 33½″ high. It is equipped with a high volume, high pressure rotary pumping unit for hose-cleaning motor blocks and other large parts. The pumping unit is portable and may be used as a general purpose transfer pump for solvents, oils, etc. This model is also equipped for agitating the fluid by means of air or pump.

The smallest of the three, Model L-73, is 21″ wide, 21″ long, and 34½″ high. Being on casters, it is easily portable.

These units are used for cleaning automotive and aviation parts, farm implement parts, machine parts, and for cleaning dies and tools, as well as appliance parts.

All three units are similar in exterior design. A catalog describing the entire line and Gray-Mills Agitene solvents is available on request. The solvents are used cold in all of these units. For complete information, write Gray-Mills Co., Dept. MF, 1948 Ridge Ave., Evanston, Ill.

Porcelain Enamel

The O. Hommel Co., Dept. MF, Pittsburgh, Pa., has announced the development of a new porcelain enamel, "Tite-Wite." According to Mr. Ernest Hommel, president, it will make possible the use of porcelain enamel on many additional products that have heretofore not been finished with porcelain enamel. It is not possible to evaluate the increased potential market for porcelain enamel that "Tite-Wite" makes possible.

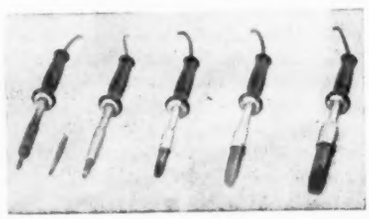
"Tite-Wite" is a super opaque white cover coat in both regular and acid resisting porcelain enamels. It can be applied nearly as thin as the best organic paint finishes. Tests show reflectance readings of 75 to 80% and over when applications of 15 to 20 grams per square foot are applied. Previous to this revolutionary porcelain enamel it was necessary to apply from two to three times as much which increased the chipping hazard.

"Tite-Wite" is claimed to materially reduce production costs and to permit more extensive and successful use of porcelain enamel on new products as the thin application practically eliminates chipping which has long been the objection to porcelain enamel as a practical finish for many articles.

Research was initiated on "Tite-Wite" in the early 1930's and was continued in the company plant laboratories and at the Mellon Institute until it was interrupted by the war. The project was nearly finished at this time and was resumed after V-J Day.

Industrial Soldering Irons

A new and improved line of industrial soldering irons has been announced by the Industrial Heating Division of the General Electric Co., Dept. MF, Schenectady, N. Y.



Ranging from 75 to 300 watts in size and available with tips from ⅜ to 1¼ inches in diameter, the new irons are designed primarily for severe and exacting soldering operations in industrial plants where fast, continuous, high quality soldering is required. They are also very suitable for light, medium, and heavy intermittent soldering.

An important feature of these irons is their quick recovery and high reserve-heat capacity, which permit soldering as fast and continuously as the character of the work allows. Another feature is the use in these irons of calorized (surface-alloyed with aluminum) copper and 18-8 stainless steel for all parts subjected to high temperatures. This, together with the use of the well known Calrod heating unit, assures long life, uniform performance, low maintenance, and allows convenient renewal. The heating units can be easily replaced, since only a simple connection must be unsoldered in order to slip a new unit into place. The chisel-shaped copper tips are also calorized which retards corrosion, facilitates easy renewal, and prevents the tip threads from "freezing" to the tip holders. The irons are also furnished with Iron-clad copper tips. The working ends of these tips are surfaced with iron, which will not amalgamate with the tin in the solder, as copper does. Hence pitting and erosion of the tips are obviated and, consequently, filing is unnecessary.

Sturdily constructed, these irons are well balanced and their plastic handles are cool and easy to grip, thus reducing operator fatigue and materially contributing to consistent production.

Safety Device

A new safety device by the Dilley Manufacturing Co. is announced, to eliminate the need of goggles and face shields in many machine tool operations. This unique device, known as the Magnetic Grip-Shield, consists of thick transparent sheets of plastic anchored into a horseshoe permanent magnet. Made in various sizes, it may be instantly positioned without tools. The magnet in the base of the shield holds it in position, yet with a slight twist, may be moved to suit operating conditions. It deflects flying chips, metal dust, sparks, oil and liquids to protect machine operators without obstructing vision. Used on all types of machinery such as lathes, grinders, drill press, milling machines, buffing and sanding machines, or for wood working machines such as band saw, joiner, planer, jig saw and any other types where protection is needed. Sizes range from 3″ x 4″ to 8″ x 10″ and also comes in hood type for long time operations. Manufactured by the Dilley Manufacturing Co., Dept. MF, 10148 Euclid Ave., Cleveland 6, Ohio.

Safety Goggle

A new dust goggle which provides greater safety and comfort for industrial and other workers is announced by American Optical Co., Dept. MF, Southbridge, Mass.

The new goggle is equipped with an acetate eyecup that permits a wider angle of vision and is more comfortable to wear. In addition, a thin wire mesh screen, on the inside of each side shield, gives maximum protection against fine dust particles.

The new eyecups are individually shaped to conform to the contour of the right and left eye. They fit snugly against the face to keep out dust and powder. The ventilating

FOR HIGH ALKALINITY pH MEASUREMENT...
FOR HIGH TEMPERATURE pH MEASUREMENT...
FOR YOUR PARTICULAR pH MEASUREMENT...

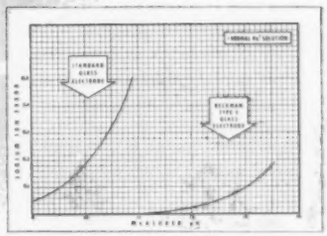
Get the instrument Beckman engineers have perfected for the job!

PROPER pH control of processing operations is one of the most important industrial developments in recent years. Step after step in the development of this modern tool has been pioneered by the Beckman research staff—bringing reduced spoilage, improved product quality and lower production costs to thousands of different plants in a wide variety of industries.

Through these years of pioneering, the Beckman organization—world's largest manufacturer of glass electrode pH equipment—has developed advanced types of pH electrodes found nowhere else in the industry . . . unique electrode assemblies that open up entirely new fields to the greater profits and higher production efficiencies obtainable through accurate pH control.

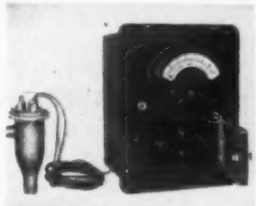
Among the many pH problems solved by Beckman engineers, the following are typical . . .

HIGH ALKALINITY Even in highly alkaline sodium solutions—a difficult or impossible application with other glass electrode pH equipment—you can obtain uniform accuracy with Beckman equipment. The Type E Glass Electrode—*an exclusive Beckman development*—makes measurements up to pH 13.5 with a sodium error of only 0.2 in 1 Normal Sodium solutions. In chart at *right, above*, compare this accuracy with that of standard glass electrodes. This advanced development is of tremendous value in highly alkaline plating processes . . . in soap solutions . . . in processing detergents, cleaners and many other applications. Investigate what this exclusive Beckman development can mean to your present or future plant processing operations!



HIGH TEMPERATURES If yours is a process involving high temperatures, remember that Beckman—*and only Beckman*—has perfected a High Temperature Glass Electrode that can be used continuously in boiling hot solutions. This advancement is particularly useful in many food processes . . . in boiler feed water conditioning . . . and in a wide range of chemical processing operations.

HARD SERVICE Still another typical Beckman development is the "X9" Electrode—a glass electrode particularly designed for unusually severe operating conditions such as continuous immersion in paper pulps, in ore slurries and other abrasive materials. So sturdy is this electrode that it withstands more than 100 pounds direct force on the immersion end without breaking, and its thick walls withstand an unusual amount of abrasion.



The Beckman Automatic pH Indicator—the most advanced pH instrument available today.

The Beckman Industrial pH Meter—ideal for portable plant and field use.

WHATEVER your pH measurement or control problem, let the Beckman research staff study your particular requirements and recommend the type of pH installation you should have. You will get the most advanced pH equipment available—equipment that will still be modern years from now.

FREE! "What Every Executive Should Know About pH"—a simple non-technical explanation of pH control, what it is, how it's used. Send for your copy today!

BECKMAN INSTRUMENTS, Inc.
National Technical Laboratories • South Pasadena 18, Calif.

BECKMAN INSTRUMENTS CONTROL MODERN INDUSTRIES

system extends over a larger area to reduce the possibility of fogging. The fine wire mesh screens prevent dust from reaching the eye. They are easily cleaned by a blast from an air hose or a thorough washing.

Equipped with clear AO Super Armorplate lenses, the goggle's retaining rings are of solid fibre. The goggle is also available with rubber cushion, on request.

Combination Mask and Hood

Industrial Products Co., Dept. MF, 2856

N. Fourth St., Philadelphia 33, Pa., announces a new combination gas mask and splash hood.

Designed to give full head and respiratory protection on operations involving toxic gases and fumes when accompanied by the hazard of splashes of acids, caustics and other harmful substances.

It is made up with a Full-Vision gas mask to which has been adapted a complete head covering of Neoprene synthetic rubber. All seams fully vulcanized. Extends well down over the shoulders, chest and back.

Hood is demountable and may be easily and quickly removed from the mask for cleaning or replacing when necessary.

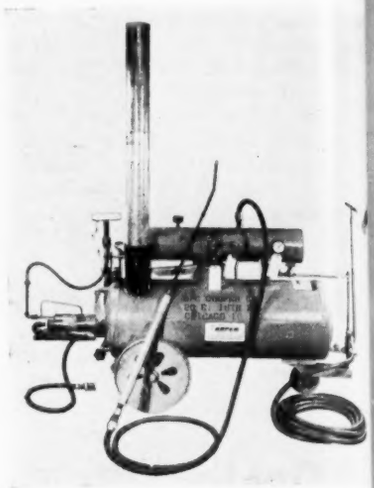
Made in the straight canister type for emergency and short period use; for longer period and day to day use with hose for attaching to compressed air line.

New Carbon Brush

An exceptionally wide band of commutation, high stability and long service life are among the advantages offered in a new carbon brush developed by the Speer Carbon Co., Dept. MF, St. Marys, Pa., for many types of industrial electric motors and generators. Known as grade No. 4029, this new Speer brush has demonstrated its ability through tests to reduce commutator wear and maintenance. The maker also recommends it for generators and traction motor units on Diesel-electric locomotives. Grade No. 4029 is offered as a standard single piece brush or in the Speer "Multiflex" construction.

Steam Cleaner

The D. C. Cooper Co., Dept. MF, 20 East 18th St., Chicago 16, Ill., announces a new automatic generating type steam cleaner which is very simple and economical to operate, to fit the requirements of the small



est or largest plant or shop. Cooper's Steam Cleaner is portable, being equipped with three wheels. Steam is produced in minutes, generated by low cost fuel. Maintains 70 lbs. pressure. It has many uses—cuts grease and grime from motor engines and overhaul parts. Used for water car washes, motor steam cleaning and many other uses.

Manodyz Process for Magnesium

Manodyz is a new electrolytic process offered by the Hanson-Van Winkle-Munn

I'll be riding that drum into your plant!

Just suppose you've given a Diversey D-Man a trial order. Usually on the very day that Diversey drum or barrel rolls into your plant, you'll find the Diversey D-Man on the job, decked in overalls with shirt sleeves rolled up.

Your D-Man is not merely an order-taker. The most important part of his job is to make certain that your plant men use that Diversey product properly and to best advantage.

A Trained Specialist!

It takes "know-how" to deliver service like that . . . know-how that can be acquired only through specialized training plus practical experience. Before a Diversey D-Man is placed in the field he is given intensive classroom instruction. During his first week or so in the field he is accompanied by an experienced D-Man, while throughout the following months his training continues.

Service That Delivers Results!

Sure it costs money to put a D-Man in your plant for a couple of hours or days just to service a drum of material . . . but it pays in the long run for you as well as us. The Diversey D-Man delivers *results* . . . not merely so many pounds of material. That's why more and more plants everywhere are looking to Diversey for *all* their metal finishing requirements. Metal Industries Dept., THE DIVERSEY CORPORATION, 53 W. Jackson Blvd., Chicago 4, Ill.

DIVERSEY

Surface Preparation Service

FOR THE METAL INDUSTRIES

DIVERSEY PRODUCTS FOR CLEANING STEEL

Diversey DC-22—A vigorous, heavy duty cleaner that quickly and completely removes dirt, oil and grease from iron and steel parts.

Diversey DC-44—A medium duty cleaner that readily removes oil and grease.

Diversey DC-16—A triple duty product used (1) as a solvent for removing oily and greasy contaminations containing solids; (2) as an emulsion cleaner for use in automatic washing machines; (3) as a light-duty rust-proofing compound between fabricating operations.

Diversey Everite—A powerful solvent for removing heat scale and rust quickly and completely without harming the sound metal.

Diversey DC-12—An electrocleaner that minimizes danger of hydrogen explosions by developing limited foam blanket. Safely removes stubborn smut and dirt.

Diversey Dilac—Microscopically etches steel surfaces in preparation for painting. Imparts a rust inhibiting coating. Leaves an ideal surface for receiving and holding an organic finish.

Company, Dept. MF, Matawan, N. J., wh produces a protective and decorative m nesium-oxide-silicate film on magnesium loys. The function of the coating is sim to the aluminum oxide film on anodi aluminum alloys.

Either an alternating current or a di current which will deliver 4 volts to Manodyz tank is needed. According to type of current, the process is referred as the Manodyz (AC) or the Manodyz (D The DC process requires a current den of 10-20 amps./sq. ft. The AC process quires a current density of 20-30 amp sq. ft. Under normal operating conditio parts may be completely processed in th minutes.

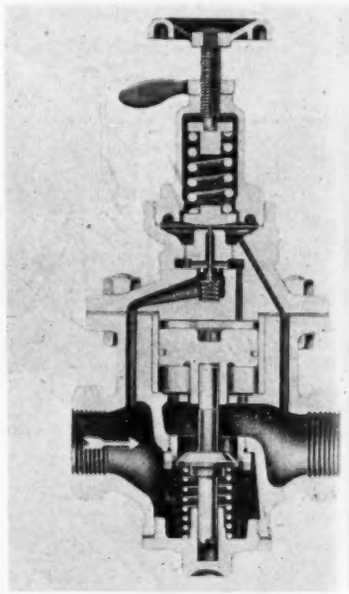
Both finishes may be dyed practically color desired by employing selected orga acid or chrome dyes in a manner similar the teachnique used in dyeing anodi aluminum parts.

The Manodyz films will withstand s spray corrosion in accordance with Army-Navy specification AN-QQ-S-91, periods of 30 to 60 hours for unsea Manodyz DC, 50 to 100 hours for unsea Manodyz AC, and with sealed Manodyz coatings, (AC or DC), up to 2000 hours w one dip and one spray coat of zinc chrom primer and one spray coat of aluminum lacquer to a total depth of .001", which the exterior paint schedule recommended.

Any standard 4-6 volt DC equipment plicable to electroplating may be used the DC process. Equipment as inexpens as high-voltage transformers used to st down city power lines from 440 to 110 v potential may be utilized for the AC proce by connecting primary windings in series a 110 volt source and connecting secondar windings in parallel to deliver 4 volts to tank. However, the cost per ampere outp of a low-voltage transformer is approxima ly 20% that of direct current equipment.

Air Reducing Valve

A new improved type of internal pi operated air reducing valve, known Class L-1A, has been announced by Les



Co., Dept. MF, 145 Delafield Ave., Lyndhurst, N. J., manufacturers of regulators, controllers and whistles. Steady, accurate regulation and tight closing in dead-end service are provided.

Among the main features of this new valve, are its stability under all flow conditions, and its responsive instant reaction to widest and most sudden variations in load. Plastic inserts in the valve seats provide positive tight shutoff and long life.

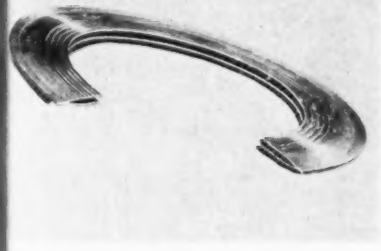
This new valve was developed during the war primarily to meet the need for a suitable air reducing valve for diesel-powered ships and smaller boats. Performance-tested under trying conditions it has proven so satisfactory, that it is believed it will be of great interest wherever an accurate reliable air reducing valve is required.

All wearing parts are renewable and complete interchangeability facilitates overhauling without removal from the pipe line. Corrosion and wear resistance, another feature is obtained by the use of stainless steel main valve, bronze controlling valve and corrosion resistant piston rings.

The new valve is available in sizes ½" through 4" inclusive, designed for initial pressures up to 400 air pressure and reduced pressures from 5 to 300 psi. A similar valve designed particularly for accurate control of small air valves is known as class JA-1, in ¼", ⅜" and ½" size and is similar in construction except that a neoprene diaphragm is used in lieu of the bronze piston. This valve has the same initial pressure range and will control reduced pressures from 1 to 300 psi.

Pressure Sealed Gasket

A unique gasket design recently released by the Goetze Gasket & Packing Co., Inc., Dept. MF, New Brunswick, N. J., literally uses the pressure to be sealed to exert a corresponding sealing pressure on the flange faces.



It is a serrated type gasket, known as Bellowseal. This gasket consists of two discs of metal (Armco Iron, Low Carbon Steel, Monel or Stainless Steel) machined on their external faces with standard serrations and welded together around their outer periphery.

It combines the pressure and corrosion resistant qualities of all metal gaskets with the light bolting requirements of a softer sealing medium. Line pressure entering the interior of the gasket exerts expansion pressure in excess of the required sealing force.

Soldering Flux

A new organic soft solder flux which is described as more effective than common rosin fluxes and which does not normally leave a corrosive residue on the work, is announced by Superior Flux Company, Dept. MF, Public Square Building, Cleveland 13, Ohio. This is known as "Superior No. 30 Supersafe Soft Solder Liquid Flux.

Because of its activity in effecting the wetting of the joining surfaces, this flux, in many cases, contributes to easier soft soldering of metal combinations which have been considered difficult to solder.

Another advantage in many soldering operations, as on electrical and radio equipment, is the complete absence of injurious deposit at the joint. The effective acid action of the flux as it comes from the container, is completely neutralized at ordinary soldering temperatures, when properly used, leaving a residue that is normally noncorrosive, nonconductive to electricity, nonhygroscopic and easily soluble in water.

The manufacturer claims that, if after solder, the work piece is well washed with water, all corrosion forming residues are completely and permanently removed.

This new flux is not offered as a general substitute for the commonly used zinc chloride fluxes, but is recommended by its manufacturer particularly for applications where rosin-alcohol is unsatisfactory or where zinc chloride or similar strong acid fluxes cannot be used because of the corrosion factor. It may be used in soldering copper, steel, silver, brass, various alloys and electroplated parts such as nickel plate, silver plate and cadmium plate.

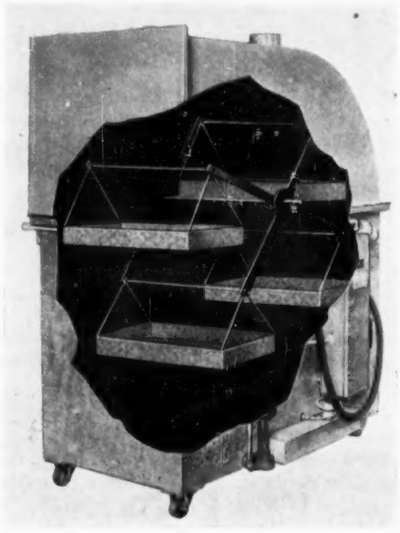
The composition of the new flux was de-

veloped by Battelle Memorial Institute in an investigation sponsored by the Tin Research Institute. So far, it has been largely used in war industries. Its manufacture by Superior Flux Company will help make it available for a wide variety of industrial soldering where permanent freedom from flux residue corrosion must be assured.

"Rotomatic" Vapor Degreaser

The new addition to the Phillips line of metal cleaning machinery is the "Rotomatic" Vapor Degreaser which brings both semi-automatic operation and a controlled cleaning cycle at moderate cost.

The Rotomatic loading device is mounted on standard Phillips Vapor Degreasers and consists of a rotating frame from which baskets are suspended in a Ferris Wheel manner. This is motor driven and governed by an automatic limit switch and interval timer which brings each basket to the open-



ing for loading and unloading and automatically swings it into the vapor bath the correct cleaning time. In addition assuring proper cleaning this system results in increased solvent economy since by erning the speed of the operation it elimin costly drag-out of solvent vapor as well minimizing the possibility of spreading fu and odors.

The unit is completely hooded with ing door covering the opening for loa and unloading baskets, and is available three sizes, handling approximately 1200 3000 or 4000 pounds per hour.

Complete details and prices available request to Phillips Mfg. Co., 3414 T Ave., Chicago 45, Ill.

Commutator Slitting Saw

A new commutator slitting saw, desig to reduce tool breakage, is announced by Gay-Lee Co. Made with a steel hub perm nently bonded to a Carboloy cemented bide blade, it is intended to eliminate fa turing due to the strain imposed by mou ing screws or nuts.

In addition to the longer life made possi by this innovation, teeth are generated provide maximum strength and long l Cutters are slightly concave to insure pro clearance. The new blades are said to p form undercutting and "U" slotting ope tions to exceptionally close tolerances. T hub is designed to support the cutting ed

Gay-Lee commutator slitting saws a made in a wide variety of standard siz and in special sizes to customers' specifi tions. An illustrated circular, listing standard sizes, can be secured from t Gay-Lee Co., Dept. MF, 117 East Hazelhu Ferndale 20, Mich.

TECHNICAL DEVELOPMENT OF 1945

(*Continued from page* 7)

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Business Items

Appointment of *Samuel G. Baker* as assistant general manager of the *Electrochemicals Department* of the *Du Pont Co.* was announced today by *F. S. MacGregor*, general manager. Mr. Baker, who has been director of the Electroplating Division of the department, will take his new position December 1.

Milton Kutz, who has been acting assistant general manager, becomes a special assistant to Mr. MacGregor, effective the same date.

A native of Tacoma, Wash., Mr. Baker first joined the Du Pont Co. as a worker on a powder production line. Later he was graduated from the University of Washington with a degree in chemical engineering and rejoined the Du Pont Co. as a chemist in 1925. In the Explosives Department, he served successively in production and sales work and in 1939 he became director of sales of the department. Four years later he joined the Electrochemicals Department as director of the Electroplating Division. He is a member of the Phi Lambda Upsilon, Tau Beta Pi and Sigma Xi fraternities. He lives at 2203 Kentmere Parkway, Wilmington.

Mr. Kutz's career in the chemical industry began in 1897. That year he joined the *Roessler and Hasslacher Chemical Co.* as an office boy, rising in 33 years to vice-president and a director of the firm.

When Roessler and Hasslacher was acquired by Du Pont in 1930, he became director of sales. In 1933 he was assistant general manager of the department. Illness forced him to take an extended leave of absence in 1941. Since Jan. 1, 1943 he has been acting assistant general manager.

Thomas M. Rodgers has joined the [sa]forces of the *Hanson-Van Winkle-Munn[ing] Co.*, Matawan, N. J., and will work on [the] development and marketing of new proces[ses] offered by this Company for the elec[tro]plating industry.

Mr. Rodgers studied chemistry at [the] University of Pennsylvania. He was co[m]missioned in the Naval Reserve and ser[ved] as Torpedo Officer on the U. S. S. PALLA[S]. He did Ordnance work at the Naval Torpe[do] station in Alexandria, Virginia, at the B[u]reau of Ordnance, and was later Officer-[in]-Charge at the Naval Ordnance plant [at] Milledgeville, Georgia. He also worked w[ith] fuses and explosives at the Naval Ammu[ni]tion Depot at Fort Mifflen. Recently he r[e]tired from active duty as a Lieutenant Commander.

Mr. Rodgers has had broad experience [in]

Thomas M. Rodgers

metal finishing. After a training course [in] the laboratories and factory at Matawan, h[e] has been assigned to the field with head[quarters] at Philadelphia, Pennsylvania.

The International Nickel Co., Inc., an[nounces] the opening of the Cincinnati Technical Section of its Development and Research Division as of December 1, 1943. It is located at 1715 Carew Tower, Cincinnati 2, Ohio.

Richard B. Kropf, metallurgist, an[d] formerly District Manager of the *Copperweld Steel Co.* at Hartford Conn., has joined International Nickel and will be in charge [of] the new section which will furnish technical assistance to industry in the territory em[bra]ced by southwestern Ohio, the southern half of Indiana, and Kentucky.

Mr. Kropf is a graduate of Michigan College of Mining and Technology and the University of Wisconsin. Before becoming associated with Copperweld Steel in 1941 he was with *Republic Steel Corp.* at South Chicago for six years, *Globe Steel Tubes Co.* at Milwaukee for two years, and *A. O. Smith Corp.* in Milwaukee for one year.

J. MacDonald Smith

J. MacDonald Smith, for many years an important factor in the business of the *Hanson-Van Winkle-Munning Co.* and its predecessor, *A. P. Munning and Co.*, has retired from Hanson-Van Winkle-Munning as of December 31st and will associate himself with *Sundmark Supply Co.* of Los Angeles, Calif., distributor of Hanson-Van Winkle-Munning products. For many years Mr. Smith was president of *Kabushiki Kaisha, A. P. Munning and Co.* of Kobe, Japan. In 1940 he returned to the United States. For a brief period he was export manager of Hanson-Van Winkle-Munning Co., and was later district manager with headquarters in New York.

After December 31st, Mr. Smith will make his home in Los Angeles, Calif. He goes with good wishes of a host of his former associates.

Acquisition of the manufacturing properties and good will of the *Aluminum Products Company*, established in 1910, manufacturers of Lifetime Aluminum Ware, aluminum pressure cookers and many other household metal products, was announced today by

W. G. Reynolds

W. G. Reynolds, vice president, *Reynolds Metals Company*.

Reynolds Metals Company will immediately expend several hundred thousand dollars for additional facilities and equipment for mass production of this nationally established deluxe quality line of cooking utensils. This will mean a very substantial increase in employment in the plants now producing these utensils.

Continuing its research program in metal finishing at Syracuse university, the *DuLite Chemical Corp.* of Middletown, Conn., has awarded a fellowship to *H. Grey Verner*. Mr. Verner will carry on his work in the chemical engineering department of the *L. C. Smith College of Applied Science*, where facilities for metal finishing research were established last year.

Mr. Verner comes to Syracuse from Wilmington, Del., where he has been a chemical engineer at the *DuPont* experimental station. He is a chemical engineering graduate of the University of Pittsburgh in 1940, where his work earned him high honors. He was a member of the *American Institute of Chemical Engineers* as a student, and was awarded membership in the national honorary engineering fraternity, Sigma Tau.

A general laboratory for service to the ceramics industry will be established in Columbus, Ohio. it was announced today by the *Electrochemicals Department* of the *Du Pont Co.*

A one-story concrete building, 70 by 100 feet, at Pennsylvania Ave. and Goodale St. has been leased as headquarters for the Du Pont technical service staff and field representatives covering the entire industry.

R. Galbraith, manager of the *Ceramic*

Products Division, said the laboratory would begin operating soon after the first of the year with about 20 men and women employed. The most modern laboratory facilities will be installed.

O. T. Fraser, field service representative whose headquarters have been in Columbus, will be in charge of the laboratory. Columbus was chosen, it was said, because of its central location in the ceramic industrial area.

Walter Kidde & Company, Inc. moved their sales and executive offices from 140 Cedar Street, New York City to their main plant at 1020 Main Street, Belleville, New Jersey on December 17th. To insure a high level of sales and efficiency of manufacturing the plant has become active in new product development. The company is branching beyond the fire extinguishing field into markets which employ either the type of manufacturing facilities Kidde now has, or the expanded selling organization the company is now building.

W. G. Reynolds, vice-president, *Reynolds Metals Company*, announced that arrangements have been completed for immediate occupancy by Reynolds of the property at Sheffield, Ala., known as *Nitrate Plant No. 1*. Reynolds Metals has leased the property from the Tennessee Valley Authority for a ten year period with a purchase option. It will be used for production of building products and will employ 300 to 500 at the start of production.

The property just leased by Reynolds consists of ten buildings, an office building and 65 acres of land. It is nine miles from Reynolds own aluminum plant in Listerhill, Ala.

The rapid growth of the Faxfilm business, established by *Rex D. McDill*, inventor of the technique, has made it necessary to form *The Faxfilm Company*, 1220 West 6th, Cleveland, Ohio.

Management of the new concern will be in the hands of *Thomas A. Card* and *Richard W. Cook*. Mr. Card brings to the company a long experience in sales management, while Mr. Cook, who has been associated with the business since its beginning, will assume financial and production control. Mr. McDill continues his association in an advisory capacity.

Faxfilm is the new method of surface examination used to determine surface characteristics of virtually all types of materials. By this method a permanent transparent plastic replica of the surface is made in a minute's time for third dimensional projection and analysis.

The new location provides ample space for future growth. New equipment is being installed for increased production of the standard items as well as the manufacture of many new devices to add convenience and greater scope to the process.

The appointment of *Mark Upson* as general sales manager of *The Procter & Gamble Co.*, Cincinnati, has been announced by *Thos. J. Wood*, vice president in charge of sales.

Upson joined the company in 1915 and at the time of his promotion was manager of the Eastern Sales Division.

E. C. Moffatt, manager of the company's Western Sales Division will succeed Upson and *Paul R. Parrette*, at present in charge of the Los Angeles District Office, will be brought to Cincinnati to succeed Moffatt.

The *C. M. Hall Lamp Co.* of Detroit recently announced the appointment of *Harry S. Walker* as Manager of the Radiant Heat Division. He replaces *Thomas P. Cuson, Jr.*, newly appointed Manager of the Sales Development Division for the entire company.

Harry S. Walker

Mr. Walker for the past eight years has represented the Westinghouse Electric Co. on various engineering and sales assignments in New York, Pittsburgh, Toledo, Louisville and Detroit.

On November 1, 1945, *Mr. Clarence A. Fee* became new president and general manager of *Abrasive Company*, Philadelphia, Pa., Division of *Simonds Saw and Steel Co.*, one of America's oldest manufacturers of grind-

Clarence A. Fee

ing wheels and other abrasive products. Mr. Fee assumes the position vacated by *J. W. McLean*, who is retiring after serving in this capacity for sixteen years and being associated with Simonds Saw & Steel Co. for forty-four years.

Coming to Philadelphia from Chicago, Ill., where he was Chicago branch manager for the Simonds Saw and Steel Co., Mr. Fee continues his long service to the Simonds organization in this new role. A native of Chicago, Mr. Fee took a clerical position with the Chicago Simonds factory office in 1912. In 1919 he joined the sales department and five years later became office manager in that sales office. He was made Chicago branch manager in 1929.

In the Illinois metropolis, Mr. Fee was active in the Chicago Chamber of Commerce, the Illinois Manufacturers Association and was also associated with the Lake Shore and Midlothian Country Clubs.

A new name will identify *Abrasive Co.* of Philadelphia effective January 2, 1946. For more specific designation of company and product, the company's corporate name will become *Simonds Abrasive Co.*

Abrasive Co., founded in 1892, has been a manufacturer of grinding wheels and other abrasive products for over half a century. In 1927 the company was purchased by *Simonds Saw and Steel Co.* of Fitchburg, Mass., manufacturers of saws, files, machine knives and steel specialties since 1832. It was at that time that Abrasive Co. became a division of the Simonds organization.

Simultaneous with the change in name, a new Simonds master trademark will be officially adopted. This new trademark will identify all products of Simonds Abrasive Co. as well as those manufactured by all branches of the Simonds Saw and Steel Co. There is no change whatsoever in ownership, management or policy.

George R. Larsen has joined the *Marion Electrical Instrument Co.* at Manchester, N. H., in the capacity of development engineer.

During the war Mr. Larsen, a graduate E. E. of the University of Idaho, was associated with the Signal Corps Engineering Laboratories at Fort Monmouth, N. J., where he did important work in the Component Parts Section.

Harris Pump & Supply Co., Pittsburgh, Pa., has been appointed distributor for *Gaybex Corp.*, Nutley, N. J., manufacturers of degreasing compounds, solvents and cleaners.

William A. Hancock has been appointed sales manager of the Gaybex Corp. to succeed *John B. Moore* who will assume the post of president and general manager of the company. Mr. Hancock was formerly with Eastern Aircraft, Bloomfield Division, General Motors Corp., Bloomfield, N. J., as supervisor of expediting and purchasing contacts.

To provide space for increased manufacturing capacity necessary to meet the demand for *Presto Products*, the *Manderscheid Co.* has moved to 810 Fulton St., Chicago, 7, Ill. Floor space at the new address is three times that formerly occupied at 605 W. Washington Street.

New and larger Pacific Coast Region offices of *Detrex Corporation*, Detroit, Mich., have been established at 112 West Ninth St., Los Angeles 15, Calif., telephone Tucker 2578.

This office which is under the supervision of *Mr. S. B. Crooks*, Pacific Region manager, functions as sales and service headquarters for the Pacific Coast and Rocky Mountain States. In addition to controlling division offices in the territory, the Los Angeles branch supervises all local stocks of alkali- and emulsion-compounds, vapor-degreasing solvents and standard metal cleaning machines. Direct customer service for Southern California is also handled from this office.

Charles C. Martin has been appointed a vice-president of *Rheem Research Products, Inc.*, Baltimore, Md., manufacturers and marketers of Iridite. In his new position Mr. Martin will asume many of the duties and responsibilities previously held by the executive vice-president for the management and direction of the company. Mr. Martin has, since July, 1944, been administrative manager and assistant director of the Rheem Manufacturing Company's research laboratories at Pasadena, Calif.

George W. Lonergan, president of the *H. V. Walker Co.*, Elizabeth, N. J., manufacturers of industrial finishes, has been elected treasurer of the *National Magnesium Corp.* of Maryland.

Located in Elkton, Md., the National Magnesium Corp. is the world's largest producer of magnesium powder. The corporation received four Army-Navy "E" awards for its war production efforts.

John J. Conroy, III, was elected president and *Milton Lennard*, vice-president. Both are of New York City.

General offices of the corporation are at 74 Trinity Place, New York City.

Courses In Electroplating

THE Institute of Electrochemistry and Metallurgy, 59-61 East Fourth St., New York City, will offer specialized courses in the field of electroplating and metallurgy during 1946. Registration will be held for the Spring courses from *January* 28th to *February* 1st inclusive and the first class meeting will occur on *February* 5th. The following studies will be offered:

Electroplating II.

This course is designed to give the electroplater a knowledge of the ways and means of obtaining better deposits by applying the latest scientific methods of electrochemistry to electroplating. One hour of each evening will be devoted to a lecture on the theoretical aspects of the subject and two and one-half hours will be spent in the laboratory where the student will apply the principles set forth in the lecture. Copper, nickel, zinc, cadmium, chromium, silver, and brass will be deposited from aqueous solutions. While plating the above metals, the factors governing the character of the deposit such as current density, temperature, pH, etc. will be noted. Other experiments will include throwing power, single electrode potential, addition agents, resistance of solutions, anodizing and coloring aluminum, corrosion tests, etc. After these are complete the students will prepare standard solutions and make analyses of all the important constituents of the above plating baths. Tuesday and Wednesday, 7:30-11:00 P. M. Prerequisite: Electroplating I or its equivalent. *Dr. Young, Mr. Klinse* and *Mr. Bundy*. Fee: $45.00.

Metallurgy II (Metallography).

This course is designed to teach the student preparation of metallographic samples for microscopic examination. Various samples of different metals and alloys will be polished, etched, and examined under the microscope. The detection of faulty alloys and metals will be stressed. *Dr. Young, Mr. Klinse* and *Mr. Bundy*. Tuesday and Wednesday, 7:30-11:00 P. M. Fee: $25.00.

Research II

This course is designed to give the practical electrochemist a chance to investigate problems in his field. One-half hour per week is devoted to a conference with the instructor in which the method of attack is laid out. The remaining time is spent in the laboratory where the student applies his knowledge and technique to the solving of problems which arise in such an investigation. Tuesday and Wednesday, 7:00-11:00 P. M. *Dr. Young.* Fee: $30.00.

Time payments may be arranged if desired.

For further information call *Dr. C. B. Young.* ORchard 4-1778 or LEonia 4-3[illegible]

News from California
By FRED A. HERR

John Bowman has resigned as head of the metal finishing department at *Paramount Film Studios* and has associated himself with *A. J. Ahlschlager* in the operation of *Du-Lite Chemical Products Co.*, 1146 South Olive St., Los Angeles, Pacific Coast representatives for Du-Lite Chemical Corp.

Frank W. Jones, prewar sales executive for the *Wyandotte Chemicals Co.*, has received his discharge as a Navy lieutenant and has been named to head the Light Metals Division of Northrup Aircraft, Inc., Hawthorne, Calif. The division is the newest of the Northrup enterprises.

Recently discharged after three years service in the Mediterranean war zone, *E. H. Witte* has joined the plating staff of the *Cadmium & Nickel Plating Co.*, Los Angeles. Before the war he was associated with his father, *Julius D. Witte*, in the *Witte Plating Co.*, Chicago, and was an active member of Chicago Branch of the A.E.S.

Several former Chicagoans, now members of Los Angeles branch, indulged in some "I knew him when" reminiscences when the name of Mr. Witte's father was mentioned. Among those who had known Julius Witte before World War I were *Clarence E. Thornton*, Southern California manager for the *Chas. F. L'hommedieu & Sons Co.*, formerly secretary of Chicago Branch, A.E.S., and *Ernest L. Lamoureux*, one-time Chicago district manager for *Hanson-Van Winkle-Munning Co.*

Arthur Jahnke, formerly with *Christensen Plating Works*, Los Angeles, has been appointed foreman of the bright nickel department for Cadmium & Nickel Plating Co.; and *Charles DeMarques*, formerly with *National Supply Co.*, Torrance, Calif., has been named foreman of the barrel plating department.

Ray Ball is superintendent of Cadmium & Nickel Plating Co., and *Bob Gripp*, chief plater.

John Manning, with *Wolverine Brass Co.*, Grand Rapids, Mich., before the war, has been appointed chief chemist for the *Sundmark Supply Co.* of Los Angeles, distributors of burring, buffing and polishing products and other plating industry materials. At one time Manning was also with the *J. C. Miller Co.* in Grand Rapids. He was recently discharged with the rating of staff sergeant after five years of Army service.

Walton Sundmark, partner in the firm with his brother *Roger*, is back in civies, having been discharged in November from duty as a Naval lieutenant.

Joseph Sunderhaus terminated 15 years service as chief plater for the *Olds Band Instrument Co.* on December 8, and has affiliated himself with *Arthur H. Dibbern*, operator of Dibbern's, jewelers and silversmiths, 213 South Glendale Blvd., Glendale, Calif.

Mr. Sunderhaus has had extensive ex-

perience in the plating of precious metals, lately with the Olds Co. of Los Angeles, and prior to that with the *Central Silver Plating Co.*, which some years ago operated a job shop at Tenth and Flower Sts., Los Angeles, and with *William & Walker*, silversmiths.

Mr. Dibbern was formerly with *Brock's* of Los Angeles, one of the largest wholesale, manufacturing and repair jewelers of Southern California.

J. E. Hufft and *E. L. Dell*, proprietors, *Coast Plating Co.*, 6324 Santa Monica Blvd., Hollywood, held a public auction of their shop equipment on December 13, as a step toward dissolving the business. The action was precipitated by loss of their lease, it was announced. A wide variety of equipment was put on the block.

Frank Serot, who has been in charge of anodizing for the *Golden West Plating Co.*, San Francisco, for the past 2½ years, is now with the *George Nichols* plating organization in Los Angeles. He has transferred his membership from San Francisco to Los Angeles Branch of the A.E.S.

Before settling in San Francisco in 1943, Mr. Serot had been with the *Dominion Ornament Co.* of Montreal, Canada.

India Paint & Lacquer Co. has announced plans for construction of a general mill-type factory building at Imperial Blvd., Alameda St., Lynwood, Calif. The build will be one-story with mezzanine, to mea 53x95 feet, and cost an estimated $50,

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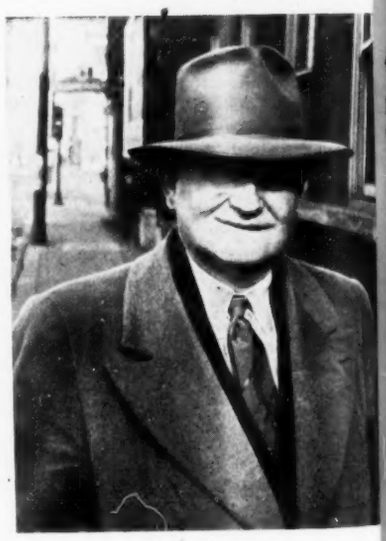
The *University of California* at Los geles and the *American Society of Me* Los Angeles Chapter, collaborated in p senting a series of three evening lect on *"Stainless Steels,"* which were given the university's chemistry building, W wood, Calif., November 26, 27 and 30.

Dr. R. A. Aborn of the research staff the *U. S. Steel Corp.*, Kearny, N. J., the lecturer.

The lectures dealt with the principal ty of stainless steels, their chemical proper resistance to general corrosion, stress, and crevice corrosion; the physical a mechanical properties of three basic grou chromium base, quench hardening; chro um-nickel base; and chromium base, quench hardening.

E. G. Richardson, who recently rejoi *Morris Plating Co.*, Long Beach, Calif., plating foreman, has resigned to organ the *Progressive Plating Co.* at 1324 Coron Ave. in that city in partnership with *S. Masburn*, formerly of the *Douglas Air Co.'s* metal finishing division, with wh firm Richardson also served for a time d ing the war.

Obituary



Albert L. Slater

Albert L. Slater, city sales representati for the *Belke Manufacturing Co.*, Chica Ill., died December 5th following a br illness.

He had worked for the company for twe years, prior to which time he was plati foreman for *Knapp Monarch, Domin Electric Co.* and *Edward Katzinger Co.*

Mr. Slater was a member of the Chica branch of the *American Electroplate Society.*

He leaves a wife and two daughte Burial was in Ridgewood Cemetery, Chica

Associations and Societies

Electrodepositors' Technical Society of London

Dr. S. Wernick, Honorary Secretary of the Electrodepositors' Technical Society of London since 1927, has been elected president of the society for the 1945-46 session.

Dr. S. Wernick

Dr. Wernick has been associated with much of the electrodeposition development in London, in particular processes for the protection of steel and aluminum; also, bright plating and electrolytic polishing.

The complete council of the 1945-46 session is as follows:

President: *S. Wernick*, Ph. D., M. Sc.

Immediate Past President: *J. R. I. Hepburn*, D. Sc., Ph. D., F. R. I. C.

Vice Presidents: *H. J. T. Ellingham*, Ph. D., A. R. C. S., A. M. I. Chem. E., F. R. I. C.; *G. E. Gardam*, Ph. D., A. R. C. S., F. R. I. C.

Hon. Treasurer: *F. L. James.*

Deputy Hon. Secretary: *S. W. Baier.*

Council

A. E. Ensor
J. W. Hothersall, M. Sc. Tech.
M. A. Manning
J. Perring
A. Smart, B. Sc.

Faraday Society Representatives

Dr. H. J. T. Ellingham
Dr. A. Hickling

American Electroplaters' Society
Los Angeles Branch

With platers now being confronted more and more with postwar coastings and the importance of proper pH control growing in importance with the return to civilian use of many finishes that were restricted during the war years, the educational session of the December 10 meeting of Los Angeles Branch of the A.E.S. was featured by a timely discussion on the application of pH in electroplating.

The speaker arranged for by Educational Committee Chairman *John F. Beall*, was *Robert W. Moulton* of the *Beckman Instrument Division* of the *National Technical Laboratories*, South Pasadena, Calif.

The speaker outlined various methods of

measuring pH, stating that the simplest and most economical to use is the colorometric method when a high degree of accuracy is not essential. He explained that while the importance of proper pH is generally known in the industry, the purpose of his discussion was to call attention to factors which might be overlooked in the daily rush of shop activity.

In the course of this talk, Mr. Mou exhibited and described the functioning of several types of pH meters.

The business session was presided over by President *Edgar W. Wells*. The following guests were introduced: *William Me* Price-Pfister Co.; *P. H. Smith*, Hallensche MacDonald Co.; *Elmer Witte*, Cadmium Nickel Plating Co.; *John E. Mann* Grand Rapids, Mich., now with Sundm Supply Co. of Los Angeles; *Walter Sm mark* of the same firm; *A. J. Ahlschlag* Du-Lite Chemical Products Co.; *Fra Serot*, George Nichols, Inc.; *A. E. Johns* O'Connor Electro-Plating Co.; *John Cocharan*, Eastman Oil Well Supply C and *A. W. Armour* and *B. C. Bartle* Chemical Process Engineering Co.

Initiated into membership were *Ada Jahnke* of Cadmium & Nickel Plating *LeRoy Christensen* of Christensen Plat Works, and *Walter Kaelin* of Rheem M search Products. The application of Fra Serot for transfer of membership from S Francisco to Los Angeles Branch was proved.

Copies of Newark Branch's Year B were distributed and elicited high pra from Los Angeles members. The chair structed the secretary to advise Newa that the general opinion was that the east branch had produced one of the fin volumes of that type which Los Ange members have had an opportunity to inspe

The branch was pleased to learn th *Marcus Rynkofs* of the *Liberty Plating* had again agreed to accept the gene chairmanship of the committee which making arrangements for the 1946 ann educational session, to be held March in the Los Angeles Breakfast Club. T outstanding success which has crowned Rynkofs' efforts when he headed this c mittee in past years prompted the bran to bring extra persuasion to bear wh Mr. Rynkofs recently announced he w not certain he could take time from business affairs to head the committee t time.

Ernest L. Lamoureux, chairman of a c mittee appointed at the November meeti to contact prospects for sustaining membership, reported that in excess of 100 lett had been mailed to a selected list, results of which could not yet be report with any degree of accuracy.

It was announced that arrangements chemistry classes had been completed the Los Angeles Board of Education a that such classes will start at Polytech Highschool, Los Angeles, on January 8, ginning at 6:30 p. m. Approximately members of Los Angeles Branch of A.E.S. have already signified their intent of enrolling in the courses dealing wi chemistry in its application to metal f position.

Twin City Branch

The December meeting of the *Twin City Branch* of the *American Electroplaters' Society* was held Monday, December 3rd, at the Covered Wagon Cafe in Minneapolis.

The meeting was called to order at 8:00 P. M. by *Paul W. Felt*, president. The secretary-treasurer's report was given and was approved as read. The treasury showed a balance of $509.27 as of December 1, 1945. The secretary was asked to read any correspondence which was received the previous month. An announcement was made that the branch had received copies of the Newark branch Year Book and would be sent out to members very soon. A letter from *Frank K.* was read asking that the members of branch consider entering papers for the Pittsburgh meeting. Papers should be sent the educational chairman's office.

Gordon W. Lillicrop, membership chairman, introduced three new members. They were *H. E. Dimick* of Mid-Continent Airlines, *W. M. Greenwood* of American Plating and Polishing and *W. E. Presser*. Following the introduction of guests, President Felt introduced the guests who were present. *Tanner Deedon* gave a report on the Convention Display Committee's work and was followed by a report on the Research Fund committee which was given by *E. H. Lindemann*, chairman.

The Door Prize for the December meeting was a billfold donated through the courtesy of *Ben J. Rosenthal* of Wyandotte Chemical Corp. It was won by *Dean C. Thom* of E. R. Frost Co.

The speaker for the evening was *Mr. R. Scott Modjeska* of Scientific Control Laboratories who spoke on "Modern Filtration—Why and How." Mr. Modjeska's paper was followed by a demonstration of a filter unit through the courtesy of Industrial Filter and Pump Mfg. Co. The paper on filtration as well as the demonstration was most interesting. Following the speaker, movies were shown on Outdoor Hunting of Big Game. They were very interesting. The meeting was adjourned at 11:00 P. M.

Robert L. Buckley, Sec'y-Treas.

Newark Branch

The *Newark Branch* of the *American Electroplaters' Society* announces the winter open educational meeting, which is scheduled to be held on January 18, 1946 at the Robert Treat Hotel in Newark, N. J., at 8:30 P. M.

It has become an obvious fact that these open meetings sponsored by the Newark branch for the past several years have been outstanding successes.

The educational value and the pertinence of the subjects presented have undoubtedly been responsible for the ever increasing attendance at these meetings. The untiring effort on the part of the educational chairman and his committee have again been rewarded in their endeavor to obtain some of the most outstanding speakers available.

The speakers and subjects to be presented are as follows: *Earl P. Kean*, Harper-Ransburg Co., Indianapolis, Ind. Subject: Electrostatic Spraying and Detearing; *Stuart Colvin*, Parker Rust-Proof Co., Detroit,

Mich. Subject: To be announced. *Stareck*, United Chromium Inc., New N. Y. Subject: *Unichrome Copper.*

Refreshments will be served after educational session by courtesy of the Chemical Co., Kearny, N. J.

William F. Brui

Chicago Branch

The 34th Annual Educational Session Banquet of the Chicago Branch w held at the Palmer House, on Sat January 19, 1946.

The Educational Session to be he 2:00 P. M., in the Club Building, will *Nickel Plating Symposium.*

This meeting will have as its gue honor, the distinguished *Dr. Oliver P.* with V. Mattacotti, Cold Nickel Baths Soft Deposits; W. M. Phillips, Watts Nickel Baths; B. Martin, Organic Nickel Baths; M. Diggin, Alloy Type N Baths; Dr. W. A. Wesley and W. L. P High Speed Dull And Bright Nickel

The banquet will be held in the Ball Room at 7:00 P. M. with Entertain and Dancing.

All tables will be set for ten wit dividual reservations. Dinner reservatio $5.00 each should be made with the S tary and will open with the mailing o notice.

Hotel reservations should be made the Palmer House as early as possib

M. H. Longfield, Secretar

Detroit Branch

There was a Victory Party at the Statler on Saturday, December 8, st with the Educational Session at 2 dinner at 7 P. M. 900 seats were sold, is all the room the Statler would let us We could have sold many more. Hun have asked for tickets for the past weeks.

Presiding at the afternoon meetin Honorary Chairman was *A. Kenneth Gr* the national secretary of the Society.

Walter Pinner, the national presid the Society, who is in charge of the e plating department of the *General S Bumper Co.*, made a report of the activities.

Carl Heussner, head of the research de ment of the Society, and head of the che engineering department of the *Chrysler poration*, talked about the research pr now under way.

Another speaker, *"Boss" Charles Tow Kettering*, head of the research labora of the *General Motors Corp.*, chose fo topic "Looking Into the Future."

Dr. Walter R. Meyer of *The Ethyl* discussed electroplating upon aluminum pointed out specific instances where this metal can be used decoratively in the de ing of a car. This has not been done t extent on automobiles.

Dr. F. W. Stockton, of *Standard Spring Co.*, of Coraopolis, Pa., headed research on Preparation and Platin

Nickel on Heat Treated High Carbon Steel. A paper was given by *Margaret E. Morrison* who worked with *Dr. J. Michael Kulchak* on this problem. It covered the work on SAE steel 1085 which is used in auto bumpers. The talk showed a scaly, heat-treated steel pickled with dilute sulfuric acid containing inhibitors by cathodic electrolysis. Also the effects of anodic pickling with concentrated sulfuric acid, showing their effects on polishing, alkaline cleaning, acid dips, plating, polishing, buffing, and adhesion. The title was "*Boundaries of Good Practice in Preparation and Electroplating on Heat Treated High Carbon Steel.*"

Attending the session was a distinguished visitor from London, England, *A. W. Hothersall*. Dr. Hothersall is a past president of the *Electrodepositors Technical Society.*

The afternoon program was under the direction of *Kenneth Wall* of the *Ford Motor Co.*

The dinner and entertainment and dancing which followed had as its chairman, *George L. Nankervis* of the *G. L. Nankervis Co.* The dinner started at seven o'clock and was followed by entertainment and dancing.

G. A. Pillsbury.

Manufacturers' Literature

Corrosion-Resistant Masonry

U. S. Stoneware Co., Dept. MF, Akron 9, Ohio has issued a new booklet entitled "*Corrosion-Resistant Masonry Material and Construction Manual.*" The booklet, which was prepared by the engineering staff of the company, contains many helpful facts and suggestions pertaining to materials and construction methods for tanks, towers, sumps, floors and other masonry construction.

Copies may be obtained by requesting *Bulletin* 810.

Corrosion Inhibitors

A 12-page booklet entitled "*Chromate Corrosion Inhibitors in Bimetallic Systems*" now off the press is offered by the *Mutual Chemical Company of America*, 270 Madison Ave., New York 16, N. Y.

Based upon technology under conditions encountered in practice, the bulletin supplements and brings up to date the report issued in 1941 on the same subject. Data covering tests which have been under observation for five years include corrosion scores, weight loss, pitting, ph, and chromate consumption.

Practical applications described in the booklet, which was written by *Marc Darrin* of the Mutual Company, include air conditioning systems, refrigeration brines, automobile systems, Diesel engines, power rectifiers, and other recirculating and quiescent systems.

A request on company letterhead will bring the booklet to interested readers.

Industrial Cleaning

Plane Portraits—a 28-page booklet, illustrated in color, contains a series of articles published by the Editors of Air Tech magazine as a service to the Aviation Industry and in recognition of the growing im-

portance of chemistry in the care and maintenance of aircraft.

The chemical processes and materials described in Plane Portraits are now available to help in solving production and maintenance problems in every industry. Turco has been fortunate enough to secure sufficient quantities of this booklet to offer it, without cost, to all interested in such industrial problems as corrosion prevention, paint removal, the preparation of aluminum surfaces, engine overhaul, surface coatings, the cleaning of transparent plastics.

In addition to the technical data, Plane Portraits also contains 8" x 11" photographs, in full color, of popular planes.

Write today and ask for free copies—enough for the Chemists, Engineers, the Purchasing Agent and general maintenance men in your organization. Address: Turco Products, Inc., Dept. MF, 6135 South Central Ave., Los Angeles 1, Calif.

Buffing and Polishing Machines

Bulletin B2 is the designation given to a four-page folder published by *The Standard Electrical Tool Co.*, Dept. MF, 2503 River Road, Cincinnati 4, Ohio.

This bulletin describes in detail their infinitely variable speed buffing and polishing machines now available in sizes from 1 hp to 15 hp. The "Speedial" control instantly reflects any spindle speed change from 1500 to 3000 rpm to permit both buffing and polishing on the same machine at the required speed—and furthermore, as wheels reduce in diameter, the peripheral speed may be maintained by instantly increasing the spindle speed.

Rubber and Synthetic Products

Covering a wide range, a new 12-page booklet on rubber and synthetic products created to suggest application of these products to industrial designers has just been published by *The B. F. Goodrich Co.*, Dept. MF, Akron, Ohio. Copies are now available upon request.

Opening pages are devoted to Koroseal, the synthetic flexible material which has many uses. Physical and chemical properties of Koroseal are outlined in detail, as well as a large number of uses where it has solved problems which had proved baffling when other materials were tried.

Two pages are given to a description of the company's diversified line of Vibro-Insulators, devices of rubber and metal which reduce vibrations of machinery and the buildings in which they are situated, as well as lessening fatigue of workers and saving wear and tear of equipment. The company's Torsilastic rubber spring, in which rubber in torsion is used as a suspension for vehicles, is included and its advantages over older materials described.

Rubber lined equipment, including tanks and tank cars for handling corrosive acids or alkalies, as well as valves, pipes and fittings which serve the same purpose are described and pictured, with a table of dimensions standard Vulcalock rubber lined tanks.

Other products of interest to the develo of equipment used by industry outlined molded, extruded and lathe cut rubber; thetic rubber and plastic products; a rubber coverings for any smooth or ir lar shaped metal part; the new pre sealing zipper, a water-tight, air-tight pressure-tight seal that zips up swiftly; lubricated Cutless rubber bearings; FHP Multi-V belts, adhesives, sponge, hard sheet rubber.

Wheelabrator Swing Tables

Complete information about the new W abrator Swing Table is contained in catalog *No. 214* recently published by *can Foundry Equipment Co.*, Dept. MF S. Byrkit St., Mishawaka, Ind.

Detailed information on each of the sizes including construction features, o dimension drawings and specifications i tained in the twelve-page catalog. In tion, sections of the catalog are devote ventilation requirements, operating peri ance facts, installation photographs a list of users of the equipment.

A copy of catalog No. 214 may be obta directly from the manufacturer.

The American Line

A revised edition of "*The American L* a 24-page reference catalog of the line of products manufactured by *Amer*

Foundry Equipment Co., Dept. MF, 555 S. Byrkit Street, Mishawaka, Ind., has been released.

This profusely illustrated catalog presents a detailed summary of each of the following American products: Wheelabrator Airless Blast Cleaning Equipment—Tumblasts, Tables and Special Cabinets; American Airblast Rooms, Cabinets, Accessories and Supplies; Wheelapeening (Shot Peening) equipment for improving the fatigue life of stressed parts; Metal Washing equipment; Dustube cloth bag type Dust Collectors; Sandcutters for conditioning foundry sand; Rod Straightener and Shear Machine; and Airblast Long Lyfe Nozzles.

Also included are operating views of typical installations of these products in leading industrial plants. An interesting section is devoted to a brief description of the mechanics, application and advantages of the Airless Wheelabrator method of abrasive blast cleaning. A copy of this general reference catalog, No. 40, may be obtained directly from the manufacturer.

New Books

Dictionary of Metal Finishing Chemicals. By Nathaniel Hall and G. B. Hogaboom, Jr. Published by Metal Industry Publishing Co., 11 West 42nd St., New York 18, N. Y. 129 pp. Price: $3.00. This volume fills the need in the metal finishing field for a handy source of information concerning the chemicals employed. The technical and common names are listed in alphabetical order together with information as to physical appearance, chemical formula, molecular weight, melting and boiling points, and solubility. Available grades, types and sizes of shipping containers are also given, all of which are of help in identifying the contents of unlabelled packages which are found in most plating rooms. A special section contains tables of degrees Baumé and specific gravity for solutions of a great many salts. Various solutions and dips employed in the finishing department may be easily controlled by the use of an hydrometer and these tables. The authors, editors of the *Plating & Finishing Guidebook*

nd associate editors of *Metal Finishing*, as a result of their familiarity with the requirements of the industry, have compiled a reference volume which belongs on the shelf of every metal finisher.

Electroplating. By S. Field and A. Weill. Published by Pitman Publishing Corp., 2 West 45th St., New York, N. Y. 1945. 483 pp. Price: $5.00. The number of books dealing solely with the subject of electroplating is so small that even a new edition of an old book should be added to the library of the progressive plater. The present edition of the authors' work contains much helpful information. The method of presentation is not too scientific and the explanations can, therefore, be understood without deep study. For example, the pH system is briefly described without any mention of logarithms.

Considerable space is given to plating equipment. The English platers apparently are still satisfied with rheostats, polishing lathes, and some other equipment we would call old-fashioned. On the other hand they have used procedures such as air agitation of nickel solutions and reverse current in sulfuric acid before plating, which we have been slow to adopt. Even though these treatments and operations may be passed over lightly on this side of the ocean, we cannot ignore other English contributions to the industry, such as vapor degreasing and anodizing.

Each of the standard types of plating solutions is discussed, as are the newer methods of depositing the less common metals and alloys. Much of the recent literature on plating is presented in a readable condensed form. Polishing, cleaning, metal coloring, anodizing and the testing of solutions and deposits are other subjects covered. Although some controversial statements are made, such as use of lead-lined tanks for cyanide silver solutions, the book as a whole is of value and is a worthwhile addition to the literature on plating.

Metallizing Non-Conductors. By Samuel Wein. Published by Metal Industry Pub. Co., 11 West 42nd Street, New York 18, N. Y. Price $2.00.

The present work deals with every known method for "metallizing" or the deposition of metals by electrolysis (plating) on non-conductors. It is divided into several sections, i. e., those processes which use chemical, mechanical and physical methods for treatment of surfaces for metallizing. In these groups the specific methods are chronologically reviewed and so the reader can very readily get a better idea of the progress made by the various workers in these arts. At the end is an alphabetical listing of contributors to the art, so that the serious workers can refer to the original sources of the information given in the text by Mr. Wein.

The text is prepared in a practical fashion so that the formulas given will be of material use and is the result of literature collected by the author for more than 25 years and which has been in use by a number of industrial concerns here in the United States and abroad.

« « ODDS and ENDS » »

Hot and Cold:

Prof. *Peter Debye* (Cornell U.) believes that a temperature of absolute zero (—273.1° C.) may soon be obtained. At this temperature the bus bars for a 5,000 ampere generator could be made of wire so fine as to be almost invisible since electrical resistance would be negligible. As a matter of fact, the generator itself could probably be made small enough to hang from the tank rods. The big problem would be to find a solution which would remain liquid so that the work could be immersed. A cold thought for a cold season!

The *National Bureau of Standards* has developed methods for determining temperature with an accuracy of 0.0001°C. We would ask why if we didn't think they had a good reason.

According to a trade magazine: *"In the degreaser the parts come in contact with both sprayed and vaporized trichlorethylene at a temperature of about 1800°F."* They might have added, if that doesn't clean the parts nothing will!

Take With A Grain Of Salt:

A large New York job shop advertises, among other things, that it performs salt spray tests on *each* barrel load of work. Do we hear any snickers from the audience??

And a large department store in the same hamlet offers a self sharpening razor at $3.75 for which they claim: *"Every part that might possibly rust is gold plated so that it's absolutely rust proof* (they underlined the words *gold plate*)." Notice they said *absolutely* rust proof, not *positively*. They've probably got all of a dime's worth of gold on it too!!

Correspondence Dept:

Nick Ellitch refers to a recent issue of a metallurgical magazine, in which an author states: *"Alkaline cleaning was adopted during the first World War."* Nick points out that electroplating started about 1840 and wants to know how the work was cleaned during the intervening 75 years. He really does know, however, since he includes a patent granted to Edmund Richard Southey on April 15, 1856, about 60 years before World War I, according to which—*"Work is dipped in a weak alkaline solution, scoured and then suspended by iron wires in a stronger alkaline solution kept at the boiling point. After about an hour of this treatment the articles are ready for the electrodeposit."*

We wonder if the author ever heard of an alkaline material which was used way, way back and was known as SOAP??

The Printed Page:

From the *New York Times: "Sodium cyanide, another war gas, aids breathing in dementia praecox, one of the commoner forms of insanity."* Anyone who breathes sodium cyanide in gaseous form (Boiling Point 2725°F.) should definitely be cured. If they mean *hydrocyanic acid gas* why don't they say so? Or are they trying to develop dementia praecox in readers like us?

From the *Patent Office Gazette: "Dyes for wire drawing."* Makes a very colorful drawing, no doubt!

Righting A Wrong:

Bill (Sulphur Baths) *McKeon* has not only been advertising in our journal for a great many years but, more important to the custodian of this page, he *reads* it. It was therefore, a double tragedy around the office last year, when it was learned that his name had inadvertently been omitted from the list of well wishers whose Christmas Greetings had been received. Our conscience has a long memory and, to put it at ease, we have decreed that Bill's name, like that of Abou-Ben-Adem (did we spell it right?), shall lead the rest this time.

Christmas Greetings

Christmas greetings were received from the following:

Wilfred S. McKeon
Agate Lacquer Mfg. Co.
The American Brass Co.
American Foundry Equipment Co.
M. E. Baker Co.
Bart-Messing Corp.
Mary, Beatrice and Betty Barrows
H. Leroy Beaver
T. R. Boggess
Adolph Bregman
D. X. Clarin
Samuel L. Cole
Lionel de Waltoff
B. D. Divine
Benjamin Dobrin
Domestic Novelty Co.
Egyptian Lacquer Mfg. Co.
Elite Watch Case Co.
Austin Fletcher
Ethel and Fred Fulforth
General Electric Co.
B. F. Goodrich Co.
L. M. Hague
Heil Engineering Co.
Hercules Powder Co.
C. J. Hinterleitner
Edward Hoff
George B. Hogaboom
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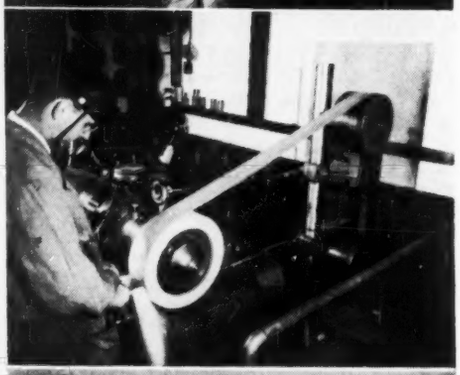
Thank you! And Cordial Greetings and Best Wishes to All Our Friends.



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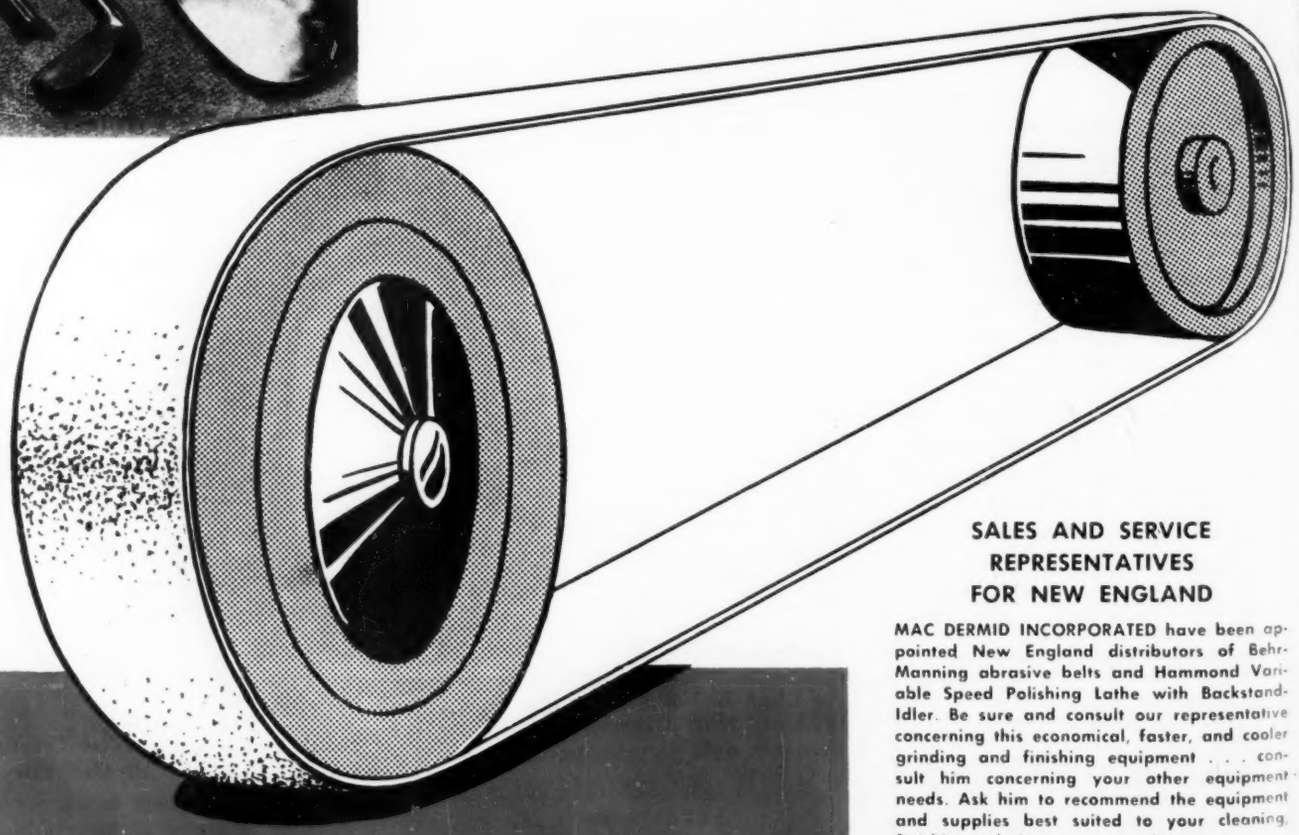

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